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Wastewater Characterization Survey,

McChord AFB WA

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AUGUST 1990

Final Report

AF Occupational and Environmental Health Laboratory (AFSC)
Human Systems Division
Brooks Air Force Base, Texas 73235-5501

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At the request of USAF Hosp McChord/SGPB, The Air Force Occupational and Environmental Health Laboratory, Environmental Quality Function (AFOEHL/EQE) conducted a basewide wastewater characterization study. Recommendations include: (1) The base should use BEE chemical-use documents or other environmental audit information (ECAMP) to identify specific sources of methylene chloride. (2) Determine if the Commissary, Castle and Ranier Dining Halls, NCO and O'Club have grease traps to catch the oil and grease from cooking; if they do perform routine maintenance; if they do not then install them as a solution to lower the oil and grease levels. (3) Perform routine maintenance on oil/water separators. This should lower the petroleum hydrocarbon levels going into the storm and sanitary sewer. Install or perform routine maintenance on grease traps. These steps may lower the oil and grease level going into the sanitary or storm sewer. (4) Monitor the pH of the oil/water separators that discharge into Clover Creek and into the sewage treatment plant because pH is regulated by a NPDES permit leaving Fort Lewis Sewage Treatment Plant. (5) Collect additional samples from the listing of shops in the conclusion for volatile aromatics and halocarbons.

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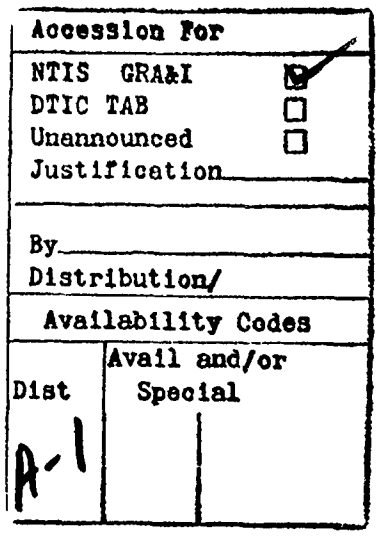

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I. INTRODUCTION

On 12 August 1988, USAF Hospital McChord/SGPB requested AFOEHL/EQE, Air Force Occupational and Environmental Health Laboratory, Environmental Quality, conduct a basewide wastewater characterization study. (Appendix A) The study was needed to identify and characterize water pollution sources.(1)

The objective of the survey was to characterize the wastestreams going into Clover Creek, points located along the sanitary sewer system, and all the oil/water separators on base.

The survey was conducted from 18 to 30 September 1989 by the following members of AFOEHL:

1Lt Shelia Scott
1Lt Charles Attebery
SSgt Richard Howell
Sgt Pete Davis
Sgt Harold Casey

II. DISCUSSION

A. Background

McChord AFB, the home of the 62d Military Airlift Wing, is located one mile south of Tacoma, Washington, and 25 miles south-southwest of Seattle, Washington. The primary mission is providing for airlift of troops, cargo, military equipment, passengers, and mail to and from areas requiring such airlift, and to participate in operations involving the airdrop of troops, equipment, and supplies for augmentation of tactical forces, when required.

During four days of the survey, the temperature highs reached into the upper 90^{o}s F. The temperature for the rest of the survey was mild with highs near 80^{o}F.

B. Sewerage System

Sanitary sewage from McChord AFB is collected and transported by gravity and pressure lines to the sewage treatment plant located at Fort Lewis Army installation. The plant has a capacity of effectively handling 7.6 million gallons per day. Presently, the treatment plant treats 2 million gallons per day. The plant consists of bar screens, four primary clarifiers, parallel trickling filters, 24 sludge beds, and secondary clarifiers. The flow into the sewage treatment plant from McChord AFB comes from the family housing area and the industrial area.(2)

Storm drainage runoff goes into Clover Creek. Clover Creek is classified as Class AA by the state. This stream originates off base, passes through the base and eventually discharges into Lake Steilacoom. Storm drainage from motor pool, aircraft wash racks and corrosion control facilities is passed through industrial separating units before discharging into Clover Creek.

C. Discharge Limitations

Presently, the limitation for discharge of skimmer 1, site 31; skimmer 2, site 22; and skimmers 4 and 6 into Clover Creek is Permit No. WA-002510-1. These effluent requirements are: (1) 15 mg/l for oils and greases, (2) temperature of 15°C, (3) pH of 6.5-8.5 units and (4) with no floating solids or visible foam in more than trace amounts.

The discharge requirements for the Fort Lewis Sewage Treatment plant are: (1) pH of 6.5-8.5 units; (2) maximum flow of 7.6 million gallons per day; (3) fecal coliform: 30-day average 200 colonies/100ml, 7-day average 400 colonies/100 ml; (4) suspended solids; monthly average 30 mg/l, weekly average 45 mg/l.

III. PROCEDURES

A. Flow. Flow into the Fort Lewis Sewage Treatment Plant comes from two areas on base, the housing area and the industrial area. A totalizer on one of the lines has been out of operation for years, so the treatment plant bills McChord AFB according to the water usage. Approximately 600,000 to 800,000 gallons per day of sewage goes to the treatment plant.(3)

B. Sampling.

1. Sampling Strategy. The sampling of all of the oil/water separators was requested by the Bioenvironmental Engineer. The sanitary points were determined by selecting key branches on the base and taking samples at those points. Various facilities within each branch were sampled also. The storm drainage system points were from oil/water separators which discharged into Clover Creek. Parameters taken were from compliance standards in the NPDES permit. Influent and effluent grab samples were taken from Clover Creek.

2. Sampling Site Numbers and Locations. Table 1 gives the locations and type of wastewater sampling sites. Figures 1 and 2 give the approximate locations of the sampling sites. Figure 3 shows the influent to Clover Creek. Figure 4 shows the oil/water separator for the burn pit.

Table 1. Sample Site Location and Type

SITE NO.	LOCATION	TYPE
1	318th Fighter Interceptor Squadron (FIS) Metals Processing, bldg 307	Sanitary
2	62nd Air Base Group (ABG) Base Reproduction, bldg 100	Sanitary
3	62nd Civil Engineering Squadron (CES) Liquid Fuels and Power Production, bldg 540	Sanitary
4	62nd Field Maintenance Squadron (FMS) Corrosion Control Shop and NDI, Hangar 2	Sanitary
5	62nd Services Squadron (SVF) Air Force Commissary, bldg 557	Sanitary
6	62nd SVF Rainier Dining Facility, bldg 1156	Sanitary
7	Clinic Laboratory, bldg 168	Sanitary
8	62nd SVF Castle Dining Facility, bldg 100	Sanitary
9	62nd SVF NCO Club, bldg 700	Sanitary
10	62nd SVF O'Club, bldg 171	Sanitary
11	Clover Creek Influent east side near Outer Drive	Storm
12	Clover Creek Effluent near A Street	Storm
13	318 FIS Age, bldg 328	O/W Sep
14	62nd ABG Auto Craft Center, bldg 1121	Sanitary
15	62nd CES Fire Station, Bldg P-6	O/W Sep
16	62nd CES Steam Plant, bldg 734	O/W Sep
17	62nd FMS Welding Shop, bldg 745	O/W Sep
18	62nd FMS Electroplating Shop, bldg 745	O/W Sep
19	62nd Supply Squadron (SUPS) Base Fuels Lab bldg P-28	O/W Sep
20	62nd Transportation Squadron (TRANS) Motor Pool, bldg 719	O/W Sep
21	8 acres of buildings, west bldg 1178	O/W Sep
22	Aircraft Washrack, southeast bldg 1178	O/W Sep
23	29.5 acres of drainage, south bldg 745	O/W Sep
24	62nd TRANS Special Purpose, bldg 774	O/W Sep
25	Bldg 776	O/W Sep
26	Flight line 1, bldg 542	Sanitary
27	Flight line 2, bldg 888	Sanitary
28	Housing, bldg 4517	Sanitary
29	Industrial waste collection, bldg 1204	Storm
30	Industrial waste collection, bldg 22	Storm
31	Facility 82037, south bldg 1204	O/W Sep
32	Facility 82031, south bldg 792	O/W Sep
33	Facility 82033, north bldg 22	O/W Sep
34	Facility 82040, west end of Clover Creek	O/W Sep
35	Facility 82032, south 305	O/W Sep
36	South bldg 328	O/W Sep
37	Facility 82034, south bldg 342	O/W Sep
38	Bldg 342	O/W Sep
39	Facility 82049, west bldg 343	O/W Sep
40	Facility 82049, southeast bldg 345	O/W Sep
41	318th FIS Jet Engine Test Cell, bldg 345	O/W Sep
42	Northwest bldg 739	O/W Sep

Table 1 Cont'd

SITE NO	LOCATION	TYPE
43	Northeast bldg 792	O/W Sep
44	South bldg 1120	O/W Sep
45	South 1166	O/W Sep
46	South 1167	O/W Sep
47	North 1167	O/W Sep
48	North 1169	O/W Sep
49	North 1170	O/W Sep
50	East 1175	O/W Sep
51	West 1175	O/W Sep
52	East Hangar 4	O/W Sep
53	Burn Pit	O/W Sep
54	Facility 24011, north CE Compound	O/W Sep
55	Facility 82051, bldg 535	O/W Sep
56	Facility 42003, near POL A area	O/W Sep
57	Facility 12002	O/W Sep
58	Pump Station #17, near Hanger 2	Sanitary
59	62nd CES Entomology, bldg 532	Sanitary

3. Sampling Frequency. Eight sites were three-day 24-hour equiproportional samples composited hourly along with four 3-day grab samples from oil/water separators. Nine sites were 1-day samples composited hourly. Thirty-six grab samples were taken from oil/water separators. Composite samples and grab samples were collected with Isco 2700 Automatic Wastewater Composite Samplers. Samples were collected in 3-gallon glass containers surrounded by ice. These samples were taken to AFOEHL on-site laboratory, building 165, and preserved according to type of analysis as shown in Table 2. The preserved samples were sent to AFOEHL/SA, Brooks AFB, Texas for analysis and some samples were analyzed by contractor.

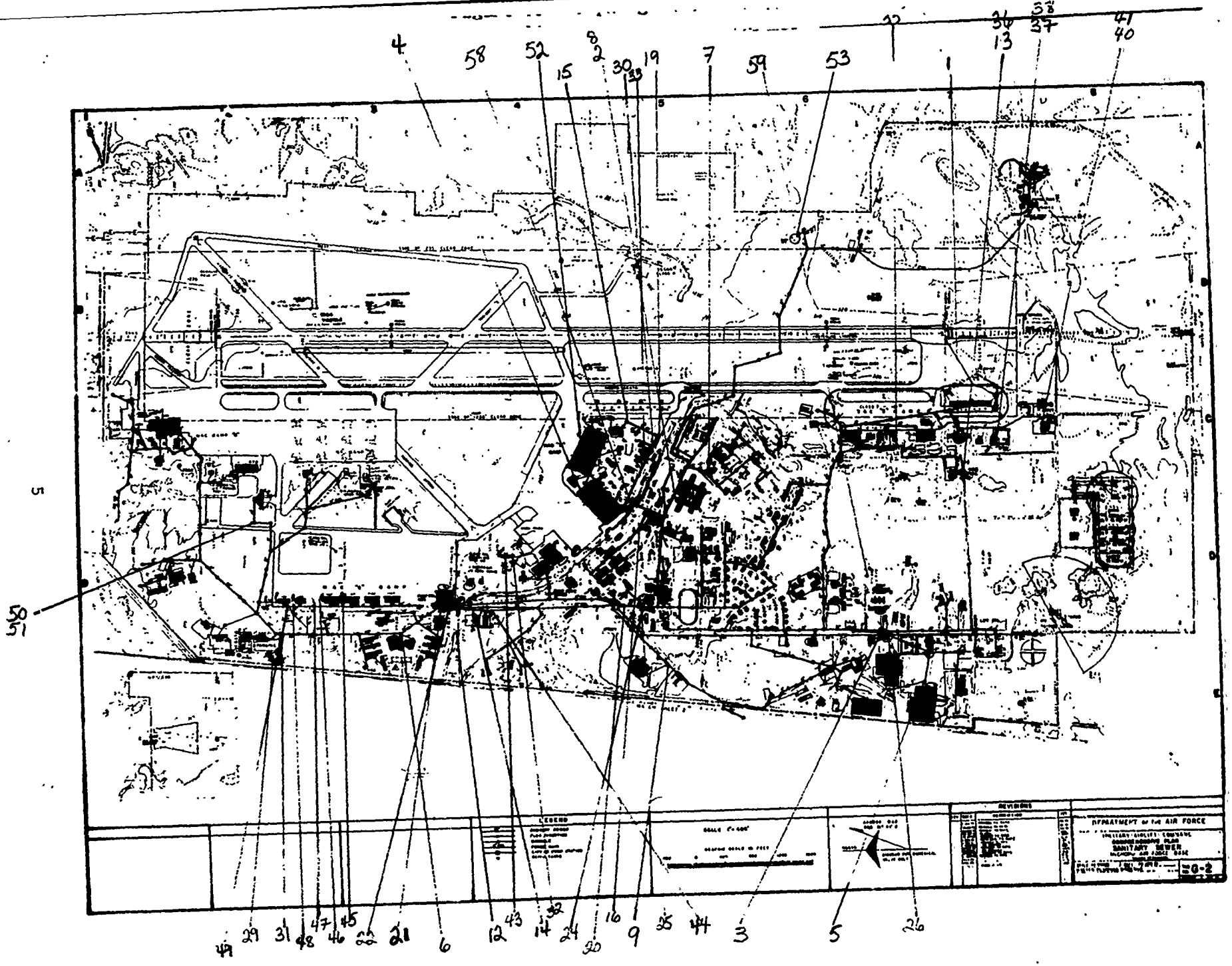
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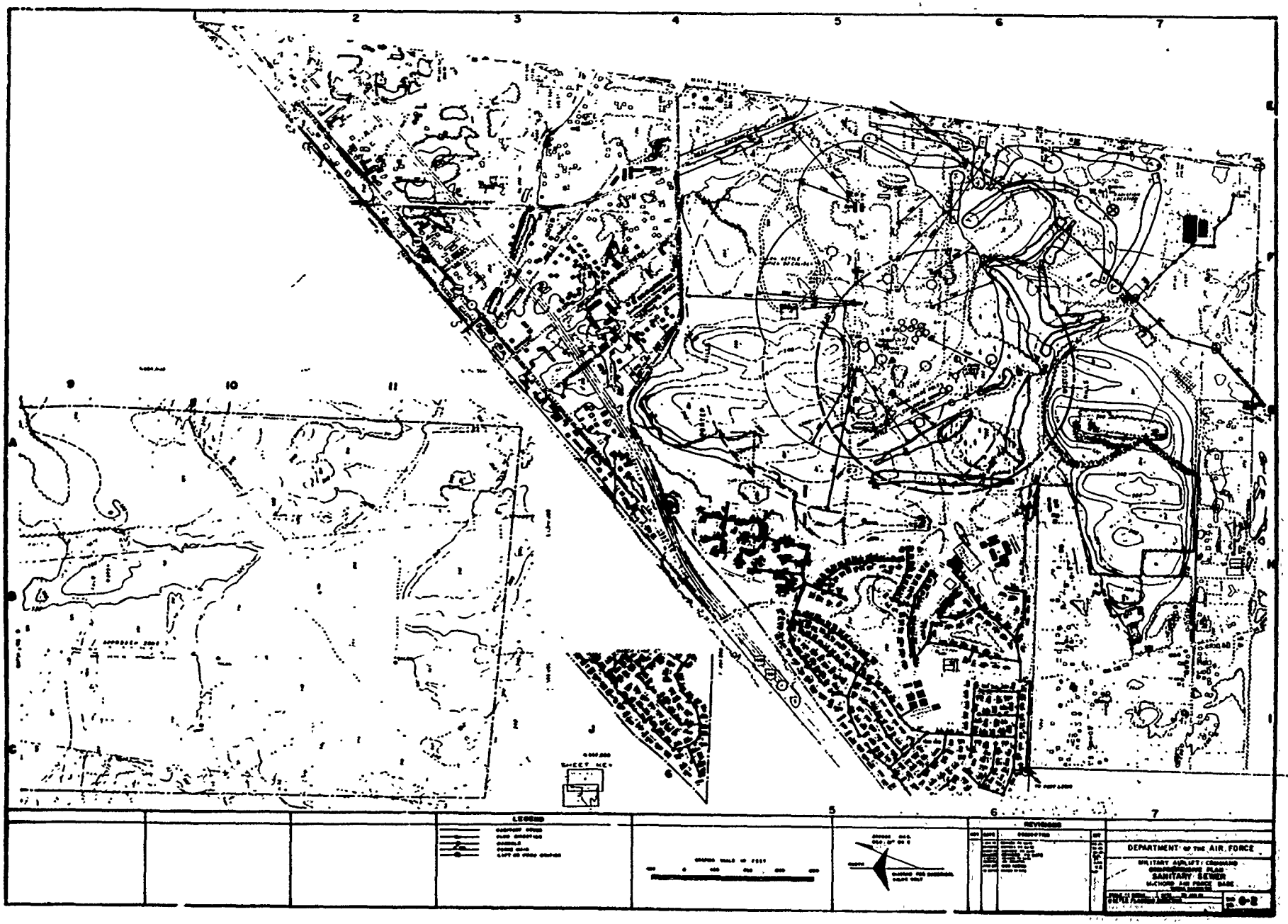
Figure 2. Sampling Site Locations



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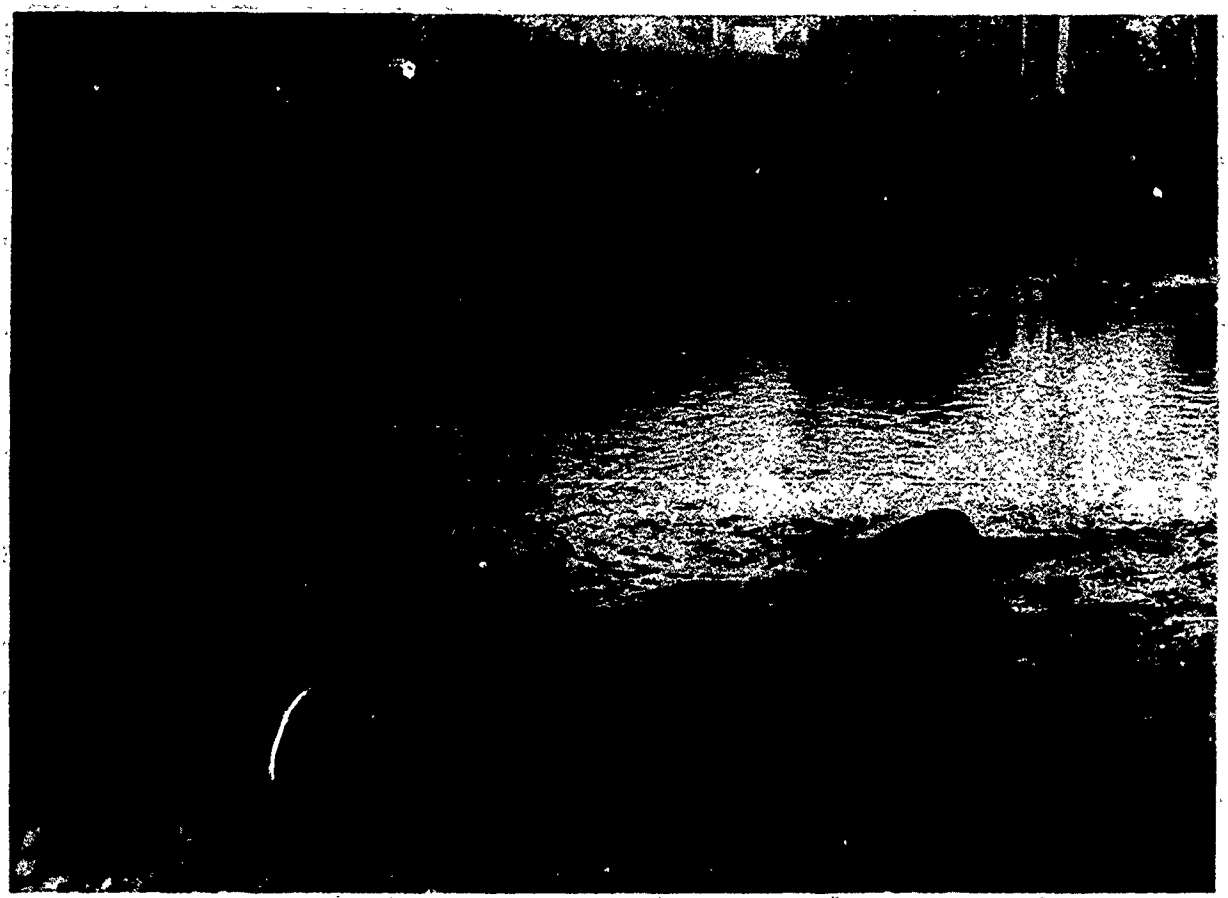

Figure 3. Clover Creek Influent

Figure 4. Burn Pit Oil/Water Separator

4. Sampling Analyses. Table 2 shows the method of analyses and preservation methods for each parameter. Table 3 gives a summary of sampling sites with corresponding analyses.

Table 2. Analyses And Preservation Methods For Sites

Analysis	Preservation	Method	Where	Who
pH	none	A423(A)	on-site	AFOEHL
Temperature	none	E170.1	on-site	AFOEHL
Biochemical Oxygen Demand	none	A405.1	on-site	AFOEHL
Chemical Oxygen Demand	H_2SO_4	E410.4	AFOEHL	AFOEHL/SA
Oil and Grease	H_2SO_4	E413.1	AFOEHL	AFOEHL/SA
ICP Metals Screen	HNO_3	E200.7	AFOEHL	AFOEHL/SA
As, Cd, Ba, Ca, Cr, Co, Fe, Mg, Mn, Ni, Zn, Al, Mo, Be, Cu, V				
Mercury	HNO_3	E245.1	AFOEHL	AFOEHL/SA
Volatile Halocarbons	HCL	E601	AFOEHL	AFOEHL/SA
Volatile Aromatics	HCL	E602	AFOEHL	AFOEHL/SA
Organochlorine Pesticides and PCB	none	E608	contract	Datachem
MBAS (Methylene Blue Active Substances)	none	E425.1	AFOEHL	AFOEHL/SA
Cyanide	NaOH	A412D	AFOEHL	AFOEHL/SA
Boron	none	A404A	AFOEHL	AFOEHL/SA
Conductivity	4C	E120	AFOEHL	AFOEHL/SA
Petroleum Hydrocarbon,	H_2SO_4	E418.1	AFOEHL	AFOEHL/SA

Notes: A-indicates Standard Methods for the Evaluation of Water and Wastewater
E-indicates EPA Methods for Chemical Analysis of Water and Wastes

Table 3. Site Analyses

PARAMETER	SITE	1	2	3	4	5			6		
						1	2	3	1	2	3
pH		X	X	X	--	--	--	--	--	--	--
Chemical Oxygen Demand		--	X	X	--	X	X	X	X	X	X
Biochemical Oxygen Demand		--	--	--	--	X	X	--	X	X	--
Oils and Greases		--	X	X	--	--	X	X	X	X	X
Boron		--	X	--	--	--	--	--	--	--	--
Cyanide		--	X	X	--	X	X	X	--	X	X
ICP Metals Screen		X	X	X	X	--	--	--	--	--	--
Mercury		X	X	X	X	--	--	--	--	--	--
MBAS (Methylene Blue Activated Substances)		--	X	X	--	X	X	X	X	X	X
Total Suspended Solids		--	X	X	--	X	X	X	X	X	X
Organochlorine Pesticides		--	--	--	--	--	--	--	--	--	--
Volatile Halocarbons		--	--	X	--	X	X	--	--	X	--
Volatile Aromatics		--	--	X	--	X	--	--	X	X	--
Petroleum Hydrocarbons		--	--	X	--	--	--	--	--	--	--
Conductivity		--	X	X	--	X	X	X	X	X	X

PARAMETER	SITE	7	8			9			10			11
			1	2	3	1	2	3	1	2	3	
pH		X	--	--	--	--	--	--	--	--	--	X
Chemical Oxygen Demand		X	X	X	X	X	X	X	X	X	X	X
Biochemical Oxygen Demand		--	--	X	--	X	--	--	X	X	--	--
Oils and Greases		--	X	X	X	X	--	X	X	X	X	X
Boron		X	--	--	--	--	--	--	--	--	--	--
Cyanide		X	X	X	X	X	X	X	X	X	X	--
ICP Metals Screen		X	--	--	--	--	--	--	--	--	--	X
Mercury		X	--	--	--	--	--	--	--	--	--	X
Silver		X	X	--	--	X	--	--	X	--	--	X
MBAS (Methylene Blue Activated Substances)		X	X	X	X	X	X	--	X	X	X	--
Total Suspended Solids		X	X	X	X	X	X	X	X	X	X	X
Organochlorine Pesticides		--	--	--	--	--	--	--	--	--	--	--
Volatile Halocarbons		--	X	X	--	--	--	--	X	--	--	X
Volatile Aromatics		--	X	X	--	X	X	--	X	--	--	--
Petroleum Hydrocarbons		--	--	--	--	--	--	--	--	--	--	--
Conductivity		X	X	X	X	X	X	X	X	X	X	X

Table 3, cont'd

PARAMETER	SITE	12	13	14	15	16	17	18	19	20
pH		X	X	X	X	X	X	--	--	X
Chemical Oxygen Demand		X	X	X	X	X	X	X	--	X
Biochemical Oxygen Demand		--	--	--	--	--	--	--	--	--
Oils and Greases		X	X	X	X	--	X	--	--	X
Boron		--	X	X	X	--	--	--	--	--
Cyanide		--	X	X	X	--	X	--	--	--
ICP Metals Screen		X	X	X	X	X	X	X	--	X
Mercury		X	X	X	X	X	X	X	--	X
MBAS (Methylene Blue Activated Substances)		--	X	X	X	--	--	--	--	X
Total Suspended Solids		X	X	X	X	X	X	X	--	X
Organochlorine Pesticides		--	--	--	--	--	--	--	--	--
Volatile Halocarbons		X	X	X	X	--	X	X	--	X
Volatile Aromatics		X	X	X	X	--	X	--	--	X
Petroleum Hydrocarbons		--	X	X	X	--	X	--	--	X
Conductivity		X	X	X	X	X	X	X	--	X

PARAMETER	SITE	21			22	23			24	25	26		
		1	2	3		1	2	3			1	2	3
pH		--	--	--	X	--	--	--	X	X	--	--	
Chemical Oxygen Demand		X	X	X	X	X	X	X	X	X	X	X	X
Biochemical Oxygen Demand		X	X	-	--	X	X	--	--	--	X	X	-
Oils and Greases		X	X	X	X	X	X	X	X	X	X	X	X
Boron		--	--	--	X	--	--	--	--	--	-	X	-
Cyanide		--	X	X	X	--	X	X	--	--	-	--	-
ICP Metals Screen		X	X	X	X	X	X	X	X	X	X	X	X
Mercury		X	X	X	X	X	X	X	X	X	X	X	X
MBAS (Methylene Blue Activated Substances)		X	X	--	X	X	X	X	X	X	X	X	X
Total Suspended Solids		X	X	X	X	X	X	X	X	X	X	X	X
Organochlorine Pesticides		X	--	--	--	X	--	--	--	--	X	--	-
Volatile Halocarbons		X	--	X	--	X	--	--	X	X	X	X	-
Volatile Aromatics		X	X	--	X	X	X	--	X	X	X	X	-
Petroleum Hydrocarbons		X	X	--	X	X	X	X	X	X	X	X	X
Conductivity		X	X	--	X	X	X	X	X	X	X	X	X

Table 3, cont'd

PARAMETER	SITE	27			28			29			30			31	32
		1	2	3	1	2	3	1	2	3	1	2	3		
pH		-	-	-	-	-	-	-	-	-	-	-	-	X	X
Chemical Oxygen Demand		X	X	X	X	X	X	X	X	X	X	X	X	X	-
Biochemical Oxygen Demand		X	X	-	X	X	-	X	X	-	X	X	-	-	-
Oils and Greases		X	X	X	X	X	X	X	X	X	X	X	X	X	-
Boron		-	-	-	-	-	-	X	X	X	X	X	X	X	-
Cyanide		-	-	-	-	-	-	-	X	X	-	X	-	X	-
ICP Metals Screen		X	X	X											
Mercury		X	X	X											
MBAS (Methylene Blue Activated Substances)		X	X	X	X	X	X	X	X	X	-	X	X	X	-
Total Suspended Solids		X	X	X	X	X	X	X	X	X	X	X	X	X	-
Organochlorine Pesticides		X	-	-	-	-	-	-	-	-	X	-	-	-	-
Volatile Halocarbons		X	X	-	X	X	-	X	X	-	X	X	-	X	X
Volatile Aromatics		X	X	-	X	X	-	X	X	-	X	X	-	X	X
Petroleum Hydrocarbons		X	X	X	-	-	-	X	X	X	X	-	X	X	-
Conductivity		X	X	X	X	X	X	X	X	X	X	X	X	X	X

PARAMETER	SITE	33	34	35	36	37	38	39	40	41	42	43
pH		X	-	X	-	X	X	X	X	X	X	X
Chemical Oxygen Demand		X	-	X	X	X	X	X	X	X	X	X
Biochemical Oxygen Demand		-	-	-	-	-	-	-	-	-	-	-
Oils and Greases		X	-	X	X	X	X	X	X	X	X	X
Boron		-	-	-	-	-	-	-	-	-	-	-
Cyanide		X	-	X	X	X	X	X	X	X	X	X
ICP Metals Screen												
Mercury												
MBAS (Methylene Blue Activated Substances)		X	-	-	-	X	X	X	X	X	X	X
Total Suspended Solids		X	X	X	X	X	X	X	X	X	X	X
Organochlorine Pesticides		-	-	-	-	-	-	-	-	-	-	-
Volatile Halocarbons		X	X	-	X	-	X	-	X	-	X	X
Volatile Aromatics		-	-	-	X	-	X	-	X	-	X	X
Petroleum Hydrocarbons		X	X	X	X	X	X	X	X	X	X	X
Conductivity		X	X	X	X	X	X	X	X	X	X	X

Table 3, cont'd

PARAMETER / SITE	44	45	46	47	48	49	50	51	52	53	54
pH	X	X	X	X	X	X	X	X	X	X	X
Chemical Oxygen Demand	X	X	X	X	X	X	X	X	X	X	X
Biochemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-
Oils and Greases	X	X	X	X	X	X	X	X	X	X	X
Boron	-	-	-	-	-	-	-	-	-	-	-
Cyanide	X	X	X	X	X	X	X	X	X	X	X
ICP Metals Screen											
Mercury											
MBAS (Methylene Blue Activated Substances)	X	X	X	X	X	X	X	X	X	X	X
Total Suspended Solids	X	X	X	X	X	X	X	X	X	X	X
Organochlorine Pesticides	-	-	-	-	-	-	-	-	-	-	-
Volatile Halocarbons	X	X	X	X	X	X	X	X	X	X	X
Volatile Aromatics	X	X	X	X	X	X	X	X	X	X	X
Petroleum Hydrocarbons	X	X	X	X	X	X	X	X	X	X	X
Conductivity	X	X	X	X	X	X	X	X	X	X	X

PARAMETER / SITE	55	56	57	58	59
pH	-	X	X	X	-
Chemical Oxygen Demand	X	X	X	X	X
Biochemical Oxygen Demand	-	-	-	-	-
Oils and Greases	X	X	X	X	X
Boron	-	-	-	-	-
Cyanide	-	-	X	X	-
ICP Metals Screen					
Mercury					
MBAS (Methylene Blue Activated Substances)	X	X	X	X	X
Total Suspended Solids	X	X	X	X	X
Organochlorine Pesticides	-	-	-	-	X
Volatile Halocarbons	X	X	X	X	-
Volatile Aromatics	X	X	X	X	-
Petroleum Hydrocarbons	X	X	X	X	X
Conductivity	X	X	X	X	X

IV. RESULTS

A. Introduction

Contaminant concentrations and physical and chemical parameter values are presented in the following section to characterize the wastestreams from industrial shops and other facilities on base. Grab samples from the water side of the oil/water separators are also characterized. The following is a description of sites with the analytical results. Appendixes B, C, D, E and F give complete analytical results for each site.

B. Sanitary Sewer

1. Site 1. 318th Fighter Interceptor Squadron (FIS) Metals Processing, building 307 showed the following results. Metals analysis showed none detected except the following: calcium 22 mg/l, iron 429 µ/l, zinc 394 µg/l, aluminum 262 mg/l, and magnesium (8.3 mg/l). pH was 8.53.

2. Site 2. 62nd Air Base Group (ABG) Base Reproduction, building 100 showed the following results. Metals analysis showed none detected except for the following: calcium 15.5 mg/l, iron 846 µg/l, and magnesium 9.3 mg/l. The COD was 253 mg/l. The O&G level was 0.90 mg/l. Boron level was 18.5 mg/l, total residue was 432 mg/l, filterable residue was 334 mg/l, MBAS was 0.10 mg/l and cyanide level was 0.012 mg/l. pH was 8.48. Specific conductance was 699 µmhos.

3. Site 3. 62nd Civil Engineering Squadron (CES) Liquid Fuels and Power Production, building 540 showed the following results. Metals analysis showed none detected except for the following: calcium 16.3 mg/l, iron 1158 µg/l, zinc 6340 µg/l, aluminum 155 µg/l and magnesium 8.0 mg/l. EPA Method 601 showed none detected except for the following: dichlorodifluoromethane 4.0 µg/l; 1,1-dichloroethane 0.9 µg/l, methylene chloride 2.4 µg/l, and vinyl chloride 4.0 µg/l. EPA Method 602 showed none detected except for 1,3-dichlorobenzene 1.8 µg/l. The COD was 750 mg/l. Cyanide level was 0.017 mg/l. Total residue was 943 mg/l and the filterable residue was 678 mg/l. The O&G level was 8.20 mg/l and total petroleum hydrocarbons 96 mg/l. pH was 7.27. Specific conductance was 800 µmhos.

4. Site 4. 62nd Field Maintenance Squadron (FMS) Corrosion Control Shop and NDI, Hangar 2 showed the following results. Metals analysis showed none detected except for calcium 15.5 mg/l.

5. Site 5. Air Force Commissary, building 557 showed the following results:

Day 1 showed the COD was 506 mg/l, BOD was 344 mg/l, filterable residue 310 mg/l, total residue was 334 mg/l and specific conductance 858 µmhos. EPA Method 601 analysis showed none detected except for chloroform 3.9 µg/l. EPA Method 602 analysis showed none detected except for the following: 1,3-dichlorobenzene 2.1 µg/l; 1,4-dichlorobenzene 6.7 µg/l; toluene 2.7 µg/l; benzene 3.3 µg/l; and 1,2-dichlorobenzene 1.4 µg/l. MBAS level was 0.32 mg/l.

Day 2 showed COD was 385 mg/l and BOD was 248 mg/l. O&G was 144 mg/l, cyanide level was 0.012 mg/l. Filterable residue was 496 mg/l, total residue was 673 mg/l and MBAS was 0.19 mg/l. Specific conductance was 1219 µmhos.

Day 3 showed COD was 975 mg/l. O&G was 91.2 mg/l. Cyanide level was 0.016 mg/l. Total residue was 3370 mg/l. MBAS was 6.0 mg/l. Filterable residue was 1270 mg/l. Settleable residue was 3362 mg/l. Specific conductance was 1045 µmhos. Average pH for three days of sampling was 7.33.

6. Site 6. 62nd Services Squadron, (SVF), Ranier Dining Hall, building 1156 had the following results:

Day 1 showed none detected except for the following: zinc 1455 µg/l, calcium 42.3 mg/l, iron 1043 µg/l and magnesium 4.6 µg/l. EPA Method 601 analysis showed none detected except for methylene chloride 0.7 µg/l; but methylene chloride was present in the blank. EPA Method 602 analysis showed none detected except for benzene 73 µg/l. The COD was 800 mg/l. O&G was 608 mg/l. Total residue was 499 mg/l and MBAS was 2.76 mg/l. Specific conductance was 324 µmhos. Filterable residue was 388 mg/l.

Day 2 showed the COD was 4500 mg/l. The O&G level was 416 mg/l. The cyanide level was <0.005 mg/l. Total residue was 730 mg/l. MBAS was 7.2 mg/l. Specific conductance was 525 µmhos. Filterable residue was 516 mg/l.

Day 3 showed the COD was 750 mg/l. O&G was 65.6 mg/l. Cyanide level was <0.005 mg/l. Total residue was 781 mg/l. MBAS was 3.7 mg/l. Filterable residue was 404 mg/l. Specific conductance was 412 µmhos. Average pH for three days was 6.29.

7. Site 7. Clinic Laboratory, building 168 showed the following results. Metals analysis showed none detected except for the following: calcium 9.0 mg/l, aluminum 377 µg/l, magnesium 5.7 µg/l and silver 188 µg/l. The COD was 75 mg/l. Boron level was 3.5 mg/l. Total residue was 227 mg/l. MBAS level was 0.10 mg/l. pH was 7.76. Filterable residue was 222 mg/l. Specific conductance was 415 µmhos.

8. Site 8. 62nd SVF Castle Dining Facility, building 100 showed the following results:

Day 1 showed that the COD was 470 mg/l, filterable residue 328 mg/l, and total residue 394 mg/l. Cyanide level was 0.012 mg/l. EPA Method 601 showed none detected for all chemical constituents. EPA Method 602 showed none detected except for benzene 0.7 µg/l. Specific conductance was 520 µmhos.

Day 2 showed the COD was 240 mg/l and the BOD was 342 mg/l. O&G was 44.8 mg/l. Cyanide level was 0.012 mg/l. Total residue was 342 mg/l. MBAS level was 0.013 mg/l. EPA Method 601 analysis showed none detected except for chloroform 5.0 µg/l. EPA Method 602 analysis showed none detected for all contaminants. Filterable residue was 344 mg/l. Specific conductance was 894 µmhos.

Day 3 showed COD was 41 mg/l. O&G was 0.6 mg/l. Cyanide level was <0.005 mg/l. Total residue was 158 mg/l. MBAS was <0.1 mg/l. Filterable residue was 175 mg/l. Specific conductance was 290 µmhos. Average pH for three days was 7.43.

9. Site 9. 62nd SVF NCO Club, building 700 showed the following results:

Day 1 showed that the COD was 470 mg/l, BOD was 277 mg/l, filterable residue 338 mg/l and total residue 551 mg/l. Oil and grease was 370 mg/l. Cyanide level was 0.005 mg/l. MBAS was 0.36 mg/l. EPA Method 601 showed none except for chloroform 0.3 µg/l. EPA Method 602 showed none detected for all contaminants. Specific conductance was 462 mg/l.

Day 2 showed that EPA Method 601 analysis showed none detected except for methylene chloride 33 µg/l. EPA Method 602 analysis showed none detected for all contaminants. The COD was 710 mg/l. Cyanide level was <0.005 mg/l. Total Residue was 366 mg/l. MBAS level was 0.13 mg/l.

Day 3 showed COD was 340 mg/l. O&G was 84.8 mg/l. Cyanide level was <0.005 mg/l. Total residue 434 mg/l. Specific conductance was 470 µmhos. Average pH for three days was 7.29 mg/l.

10. Site 10. 62nd SVF O'Club, building 171 showed the following results:

Day 1 showed that COD was 1375 mg/l, BOD was 17 mg/l, filterable residue 332 mg/l and total residue 534 mg/l. EPA Method 601 analysis showed none detected except for chloroform 209 µg/l and methylene chloride 31 µg/l. EPA Method 602 analysis showed none detected except for toluene 0.4 µg/l. Specific conductance was 470 µmhos.

Day 2 showed that the COD was 860 mg/l and BOD was 108 mg/l. O&G level was 34.4 mg/l. Cyanide level was <0.005 mg/l. Total residue was 413 mg/l. MBAS level was <0.1 mg/l. Specific conductance was 343 umhos.

Day 3 showed COD was 950 mg/l. O&G was 20 mg/l. Cyanide level was <0.005 mg/l. Total residue 1006 mg/l. MBAS was <0.1 mg/l. Filterable residue was 94 mg/l. pH was 6.94. Average pH for three days was 7.78.

11. Site 13. 318 FIS AGE, Building 328, skimmer 12 showed the following results: Metals analysis showed none detected except for the following: calcium 17.3 mg/l, iron 3218 µg/l, zinc 633 µg/l, aluminum 274 mg/l, titanium 104 µg/l and magnesium 5.1 mg/l. Total hydrocarbons (19.5 mg/l) exceeded the daily limit (15 mg/l). EPA Method 601 analysis showed none detected except for methylene chloride 69 µg/l. EPA Method 602 showed none detected for all contaminants. The COD was 445 mg/l. O&G level was 37.1 mg/l. Boron level was 0.9 mg/l. Total residue was 407 mg/l. MBAS level was 0.3 mg/l. pH was 6.52. Filterable residue was 196 mg/l.

12. Site 14. 62nd ABG Auto Craft Center, building 1121 showed the following results: Metals analysis showed none detected except for the following: calcium 18.5 mg/l, iron 5972 µg/l, zinc 209 µg/l and magnesium 5.9 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride 118 µg/l. EPA Method 602 showed none detected for chlorobenzene 0.7 µg/l. The COD was 65 mg/l. O&G level 1.4 mg/l. Boron level 0.35 mg/l. Total residue 213 mg/l. MBAS level was 0.3 mg/l. pH was 6.70. Total extractable petroleum hydrocarbons was 2.6 mg/l.

13. Site 15. 62nd CES Fire Station, building P-6, skimmer 27 showed the following results. Metals analysis showed none detected except for the following: calcium 9.5 mg/l, iron 2112 µg/l, zinc 310 µg/l, aluminum 279 µg/l and magnesium 5.9 mg/l. EPA Method 601 showed none detected except for methylene chloride 123 µg/l. EPA Method 602 showed none detected except for the following: ethyl benzene 3.8 µg/l, chlorobenzene 3.2 µg/l, and 1,2-dichlorobenzene 15 µg/l. The COD was 18 mg/l. O&G was 40.8 mg/l. Total residue was 117 mg/l. MBAS level 0.7 mg/l. pH was 7.26. Specific conductance was 126 µmhos.

14. Site 16. 62nd CES Steam Plant, building 734, skimmer 18 showed the following results. Metals analysis showed none detected except for the following: calcium 32.8 mg/l, iron 2137 µg/l, zinc 884 µg/l, aluminum 219 µg/l and magnesium 0.5 µg/l. pH was 6.55. COD was 263 mg/l. Filterable residue was 204 mg/l. Total residue was 254 mg/l. Specific conductance was 169 µmhos.

15. Site 19. 62nd Supply Squadron (SUPS), Base Fuels Laboratory, building P-28, skimmer 7 sample was not analyzed. The discharge overflows into Clover Creek.

16. Site 20. 62nd Transportation Squadron (TRANS), Motor Pool, building 719, skimmer 8 showed the following results. Metals analysis showed none detected except for the following: calcium 12.9 mg/l, iron 1113 µg/l, zinc 141 µg/l, aluminum 434 µg/l and magnesium 6.5 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride 1.0 µg/l. EPA Method 602 showed none detected for all contaminants. The COD was 22 mg/l. O&G was 2.40 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. Filterable residue was 171 mg/l. Total residue was 187 mg/l. MBAS level was <0.1 mg/l. pH was 7.35. The discharge overflows into Clover Creek.

17. Site 24. 62nd TRANS Special Purpose, building 774, skimmer 22 showed the following results. Metals analysis was none detected except for the following: calcium 25.3 mg/l, iron 39400 µg/l, manganese 134 µg/l, zinc 562 µg/l, aluminum 359 µg/l, molybdenum 191 µg/l and magnesium 7.6 mg/l. Total hydrocarbons (38.4 mg/l) exceeded the daily limit (15 mg/l). EPA Method 602 analysis showed none detected for all contaminants. The COD was 4760 mg/l. O&G level was 190 mg/l. Total residue was 656 mg/l. MBAS level was 3.8 mg/l. pH was 5.05. Total extractable petroleum hydrocarbons were 38.4 mg/l. Filterable residue was 634 mg/l. Specific conductance was 388 µmhos.

18. Site 25. Skimmer 23 servicing building 776 showed the following results. Metals analysis showed none detected except for the following: calcium 17.3 mg/l, iron 6550 µg/l, manganese 111 µg/l and magnesium 5.1 mg/l. EPA Methods 601 and 602 showed none detected for all contaminants. pH was 6.84. COD was 80 mg/l. Oil and grease levels were 5.5 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. MBAS was 0.2 mg/l. Filterable residue was 94 mg/l. Total residue was 174 mg/l. Specific conductance was 182 µmhos.

19. Site 26. Flight line 1, one of two branches servicing the flight line, manhole near building 542 showed the following results:

Day 1 showed that the metals analysis gave none detected except for the following: calcium 11.5 mg/l, iron 1400 µg/l, zinc 186 µg/l and magnesium 5.7 mg/l. EPA Method 601 showed none detected for all of the contaminants. EPA Method 602 showed none detected except for the following: chlorobenzene 2.8 µg/l, toluene 12 µg/l and ethyl benzene 1.1 µg/l. The BOD was 493 mg/l. The COD was 210 mg/l. O&G level was 4.8 mg/l. Filterable residue was 328 mg/l. Total residue was 271 mg/l. MBAS level was 0.26 mg/l. Total extractable hydrocarbons were 1.9 mg/l. Specific conductance was 776 µmhos.

Day 2 showed the metal analysis had none detected except for the following: calcium 12.7 mg/l, iron 817 µg/l, zinc 168 µg/l and magnesium 5.8 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride 3.1 µg/l. EPA Method 602 analysis showed none detected for 1,3-dichlorobenzene 2.0 µg/l, and 1,4-dichlorobenzene 3.4 µg/l. The BOD was 293 mg/l. The COD was 225 mg/l. O&G was 6.1 mg/l. Filterable residue was 320 mg/l. Total residue was 288 mg/l. MBAS was 0.19 mg/l. Total extractable hydrocarbons were 5.8 mg/l. Specific conductance was 730 µmhos.

Day 3 showed that the metals analysis had none detected except for the following: calcium 14.9 mg/l, iron 1325 µg/l, zinc 1901 µg/l, aluminum 246 µg/l and magnesium 6.1 mg/l. COD was 506 mg/l. O&G was 4.0 mg/l. Total extractable petroleum hydrocarbons were 5.8 mg/l. Filterable residue was 276 mg/l. Total residue was 457 mg/l. MBAS level was 0.30 mg/l. Pesicide analysis, EPA Method 608, showed none detected except for 4,4-DDE (0.52 µg/l). Average three-day pH was 7.33.

20. Site 27. Flight line 2, one of two branches servicing the flight line, manhole near building 888 showed the following results:

Day 1 showed that the metals analysis had none detected except for the following: calcium 17.6 mg/l, iron 444 µg/l, zinc 202 µg/l, aluminum 125 µg/l and magnesium 7.6 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride. EPA Method 602 analysis showed none detected except for the following: ethyl benzene 1.4 µg/l, chlorobenzene 3.2 µg/l, toluene 21 µg/l and benzene 1.1 µg/l. The BOD was 623 mg/l. The COD was 206 mg/l. O&G level was 37.6 mg/l. Total extractable petroleum hydrocarbons were 17.3 mg/l. Filterable residue was 344 mg/l. Total residue was 301 mg/l. MBAS was 0.15 mg/l. Specific conductance was 587 µmhos.

Day 2 showed that the metals analysis had none detected except for the following: calcium 15 mg/l, iron 364 µg/l, zinc 151 µg/l, aluminum 104 µg/l and magnesium 6.8 mg/l. EPA Method 601 analysis showed none detected for all contaminants. EPA Method 602 analysis showed none detected except for the following: ethyl benzene 0.9 µg/l, chlorobenzene 4.3 µg/l and toluene 1.3 µg/l. The BOD was 424 mg/l. The COD was 310 mg/l. O&G was 9.4 mg/l. Filterable residue was 158 mg/l. Total residue was 208 mg/l. MBAS was 0.13 mg/l. Total extractable petroleum hydrocarbons was 25.3 mg/l. Specific conductance was 484 µmhos.

Day 3 showed that the metals were none detected except for the following: calcium 19.0 mg/l, iron 1049 µg/l, zinc 563 µg/l, aluminum 354 µg/l and magnesium 7.6 mg/l. Total hydrocarbons (37.4 mg/l) exceeded the limit (10 mg/l). COD was 430 mg/l. O&G was 48.4 mg/l. Filterable residue was 256 mg/l. Total residue was 548 mg/l. MBAS was 0.20 mg/l. Specific conductance

was 520 mg/l. Pesticide analysis, EPA Method 608, showed none detected except for aldrin (0.13 µg/l), and alpha-BHC (0.11 µg/l). Average three-day pH was 7.05.

21. Site 28. Housing main branch located near building 4517 showed the following results:

Day 1 showed that the metals analysis was none detected except for the following: calcium 22.7 mg/l, iron 510 µg/l, zinc 112 µg/l, aluminum 175 µg/l and magnesium 8.2 mg/l. EPA Method 601 analysis showed none detected except for the following: chloroform 6.9 µg/l and methylene chloride 1.2 µg/l. EPA Method 602 showed none detected except for the following: ethyl benzene 1.9 µg/l and toluene 19 µg/l. The BOD was 180 mg/l. The COD was 200 mg/l. O&G was 81.2 mg/l. Filterable residue was 488 mg/l. Total residue was 411 mg/l. MBAS level was 0.25 mg/l. Specific conductance was 598 µmhos.

Day 2 showed that the metals analysis had none detected except for the following: calcium 21.4 mg/l, iron 262 µg/l, and magnesium 8.2 µg/l. EPA Method 601 analysis showed none detected except for methylene chloride 19.0 µg/l. EPA Method 602 analysis showed none detected except for the following: 1,4-dichlorobenzene 1.6 µg/l, ethyl benzene 0.9 µg/l and chlorobenzene 1.2 µg/l. The BOD was 211 mg/l. The COD was 158 mg/l. O&G was 6.4 mg/l. Filterable residue was 283 mg/l. Total residue was 317 mg/l. MBAS level was 0.2 mg/l. Specific conductance was 550 µmhos.

Day 3 showed the metals analysis had none detected except for the following: calcium 21.9 mg/l, iron 300 µg/l and magnesium 8.3 mg/l. COD was 145 mg/l. O&G was 10.2 mg/l. Filterable residue was 244 mg/l. Total residue was 324 mg/l. MBAS was 0.10 mg/l. Specific conductance was 592 µmhos. Average 3-day pH was 7.70.

22. Site 32. Facility 82031, skimmer 3, located south of building 792 had a pH of 8.68. Sample was not analyzed.

23. Site 33. Facility 82033, skimmer 5, located north of building 22 showed the follwing results. The COD was 258 mg/l. The pH was 6.02. Cyanide was <0.005 mg/l. Filterable residue was 250 mg/l. Total residue was 274 mg/l. MBAS level 17.0 mg/l. O&G was 14.9 mg/l. Total extractable petroleum hydrocarbons was 36.6 mg/l. Specific conductance was 260 µmhos. The discharge overflows into Clover Creek.

24. Site 38. Skimmer 14 near building 342 showed the following results. The metals anlaysis showed none detected except the following: calcium 31.3 µg/l, iron 968 µg/l, zinc 3151 µg/l, mercury 2.2 µg/l and magnesium 7.3 mg/l. EPA Method 601 analysis showed none detected except for the following: dichlorodifluromethane 11 µg/l, methylene chloride 5.7 µg/l and vinyl chloride 11 µg/l. EPA Method 602 analysis showed none detected except for benzene 0.9 µg/l. The pH was 7.53. COD was 205 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 168 mg/l. Total residue was 279 mg/l. MBAS was 1.8 mg/l. O&G level was 43.2 mg/l. Total extractable petroleum hydrocarbons were 13.7 mg/l. Specific conductance was 314 µmhos.

25. Site 40. Skimmer 16, Facility 82049, southeast of building 345 showed the following results. The metals analysis showed none detected except

for the following: calcium 49.2 mg/l, copper 153 µg/l, iron 13750 µg/l, manganese 162 µg/l, zinc 2133 µg/l, aluminum 575 µg/l, titanium 319 µg/l, magnesium 6.0 mg/l. EPA Method 601 analysis showed none detected except for vinyl chloride 57 µg/l. EPA Method 602 analysi showed none detected except for toluene 26 µg/l and benzene 35 µg/l. COD was 1600 mg/l. The pH was 9.39. Ammonia level was 5.0 mg/l. Cyanide was 0.006 mg/l. Filterable residue was 263 mg/l. Total residue was 1600 mg/l. MBAS was 52.0 mg/l. O&G level was 108 mg/l. Total extractable petroleum hydrocarbons were 38 mg/l. Specific conductance was 1031 µmhos.

26. Site 41. 318 FIS Jet Engine Test Cell, building 345, skimmer 17 showed the following results. The metals analysis showed none detected except for the following: zinc 1005 µg/l, calcium 17.9 mg/l, iron 132 µg/l and magnesium 0.3 mg/l. COD was <10 mg/l. The pH was 5.95. Cyanide was <0.005 mg/l. Filterable residue was 89 mg/l. Total residue was 73 mg/l. MBAS was <0.1 mg/l. O&G level was <0.3 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. Specific conductance was 136 µmhos.

27. Site 42. Skimmer 19 located northwest of building 739 showed the following results. The metals analysis showed none detected except for the following: calcium 10.2 mg/l, copper 147 µg/l, iron 3124 µg/l, zinc 1171 µg/l, aluminum 407 µg/l, mercury 1.8 µg/l and magnesium 3.4 mg/l. EPA Method 601 analysis could not be completed because of interfering organic compounds. Foaming also occurred indicating surfactant content. EPA Method 602 analysis showed none detected except for benzene 88 µg/l. COD was 5900 mg/l. The pH was 7.98. Cyanide was 0.123 mg/l. Filterable residue was 859 mg/l. Total residue was 1466 mg/l. MBAS was 4.0 mg/l. O&G level was 81.6 mg/l. Total extractable petroleum hydrocarbons were 60.8 mg/l. Specific conductance 338 µmhos.

28. Site 43. Skimmer 25 located northeast of building 792 showed the following results. The metals analysis showed none detected except for the following: calcium 22 mg/l, copper 256 µg/l, iron 5956 µg/l, manganese 139 µg/l, zinc 560 µg/l, aluminum 717 µg/l, mercury 1.8 µg/l, magnesium 6.1 mg/l and silver 14 µg/l. EPA Method 601 analysis could only be performed on methylene chloride 27 µg/l while the other contaminants had interferance by organic compounds. EPA Method 602 analysis could not be performed because of interfering organic compounds. COD was 6200 mg/l. The pH was 6.10. Cyanide was 0.010 mg/l. Filterable residue was 1395 mg/l. Total residue was 2059 mg/l. MBAS level was 38 mg/l. Total extractable petroleum hydrocarbons were 104.4 mg/l. O&G was 91.6 mg/l. Specific conductance was 474 mg/l.

29. Site 44. Skimmer 26 located south of building 1120 showed the following results. The metals analysis showed none detected except for the following: zinc 2456 µg/l, calcium 24.2 mg/l, iron 12220 µg/l, manganese 312 µg/l, magnesium 8.3 mg/l and silver 15 µg/l. EPA Method 601 analysis could not be performed due to interfering organic compounds. Methylene chloride (11 µg/l) was found. EPA Method 602 analysis could not be completed due to interfering organic compounds. The COD was 1300 mg/l. The pH was 6.30. Cyanide level was 0.075 mg/l. Filterable residue was 326 mg/l. Total residue was 381 mg/l. MBAS was 5.0 mg/l. O&G was 23.6 mg/l. Total extractable petroleum hydrocarbons were 5.5 mg/l. Specific conductance was 261 µmhos.

30. Site 58. Pump Station 17 located near Hangar 2, collects sewage flow from all buildings in the 01 Hangar area and showed the following results. Metals analysis showed none detected except for the following: calcium 9.8 mg/l, iron 226 µg/l, aluminum 140 µg/l, magnesium 5.1 mg/l and silver 16 µg/l. EPA method 601 showed none detected except for the following: 1,4-dichlorobenzene 14 µg/l; 1,1-dichloroethane 9.8 µg/l, methylene chloride 4.0 µg/l, and 1,1,1-trichloroethane 58 µg/l. EPA method 602 showed none detected except for the following: 1,4-dichlorobenzene 426 µg/l, ethyl benzene 36 µg/l, toluene 176 µg/l and benzene 5.3 µg/l. The pH was 7.31. The COD was 220 mg/l. Cyanide level was 0.006 mg/l. Boron level was 13.25 mg/l. Filterable residue was 208 mg/l. Total residue was 228 mg/l. MBAS level was 0.2 mg/l. O&G level was 74 mg/l. Total extractable petroleum hydrocarbons was 408 mg/l. Specific conductance was 564 µmhos.

31. Site 59. 62 CES Entomology, building 532, showed none detected on pesticide analysis, EPA Method 608.

C. Storm Drainage System

1. Site 11. Clover Creek influent, east side near Outer Drive showed the following grab sample results. The metals analysis showed none detected except for the following: calcium 12.6 mg/l, iron 167 µg/l and magnesium 4.4 mg/l. The COD was 15 mg/l. The pH was 7.26. O&G was 0.50 mg/l. Filterable residue was 90 mg/l. Total residue was 94 mg/l. Specific conductance was 138 µmhos.

2. Site 12. Clover Creek effluent near A Street showed the following grab sample results. The metals analysis showed none detected except for the following: calcium 13.2 mg/l and magnesium 4.9 mg/l. The COD was <10 mg/l. EPA Methods 601 and 602 showed none detected for all of the contaminants. The pH was 6.94. O&G was 0.60 mg/l. Filterable residue was 94 mg/l. Total residue was 103 mg/l. Specific conductance was 148 µmhos.

3. Site 17. 62nd FMS Welding Shop, building 745, skimmer 20 showed the following results. Metals analysis showed none detected except for the following: barium 201 µg/l, cadmium 191 µg/l, calcium 99.5 mg/l, chromium 202 µg/l, copper 160 µg/l, iron 83400 µg/l, manganese 884 µg/l, zinc 2357 µg/l, aluminum 1689 µg/l, cobalt 156 µg/l, titanium 1157 µg/l, mercury 2.8 µg/l and magnesium 18.2 mg/l. EPA Method 601 analysis could not be completed because of interfering organics. EPA Method 602 analysis showed none detected for all contaminants. COD was 4100 mg/l. Cyanide level was 0.012. Total residue was 2470 mg/l. Filterable residue was 1877 mg/l. Total extractable petroleum hydrocarbons was 96.4 mg/l. O&G was was 143.2 mg/l. pH was 6.35.

4. Site 18. 62nd FMS Electroplating Shop, building 745, skimmer 21 showed the following results. The metals analysis showed none detected except for the following: barium 149 µg/l, cadmium 612 µg/l, calcium 54.1 mg/l, chromium 111 µg/l, manganese 456 µg/l, zinc 2752 µg/l, aluminum 2674 µg/l, titanium 1595 µg/l, molybdenum 261 µg/l, magnesium 12.7 µg/l and iron 118.3 mg/l. EPA Method 601 analysis showed that interfering organic compounds and analysis couldn't be completed except that the concentration of methylene chloride 16.8 mg/l. EPA Method 602 analysis showed none detected. The COD was 4760 mg/l. Total residue was 714 mg/l. Filterable residue was 828 mg/l. Specific conductance was 1183 mg/l. pH was 6.35.

5. Site 21. Skimmer 9 located on the west side of building 1178 services wastewater for 8 acres of buildings and showed the following results:

Day 1 showed that the BOD was 123 mg/l. The COD was 43 mg/l. Metals analysis showed none detected except for the following: calcium 13.5 mg/l, iron 1618 µg/l and magnesium 0.4 mg/l. EPA Method 601 analysis showed none detected for all of the contaminants. EPA Method 602 analysis showed none detected for all of the contaminants. O&G level was 0.60 mg/l. MBAS level was 0.17 mg/l. Filterable residue was 75 mg/l. Total residue was 90 mg/l. Specific conductance was 86 µmhos. Pesticide analysis, EPA Method 608, showed none detected.

Day 2 showed that the metals analysis had none detected except for the following: calcium 12.9 mg/l, iron 1487 µg/l and magnesium 0.4 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride 1.8 µg/l. EPA Method 602 analysis showed none detected for all contaminants. BOD was 30.7 mg/l and COD was 45 mg/l. O&G was 0.8 mg/l with total extractable petroleum hydrocarbons (<1.0 mg/l). MBAS was <0.005 mg/l. Specific conductance was 84 µmhos.

Day 3 showed metals analysis had none detected except for the following: calcium 12.8 mg/l, iron 1016 µg/l, and magnesium 0.4 mg/l. COD was 30 mg/l. O&G level was 0.60 mg/l. Cyanide was <0.005 mg/l. Total residue was 88 mg/l. Average three-day pH was 7.16.

6. Site 22. Aircraft Washrack located on the southeast corner of building 1178, skimmer 2 showed the following results. Metals analysis showed none detected except for the following: calcium 10 mg/l, iron 273 µg/l, zinc 1856 µg/l and magnesium 0.2 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride 217 µg/l. EPA Method 602 analysis showed none detected for all of the contaminants. The COD was 18 mg/l. O&G was 1.20 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. Cyanide level was <0.005 mg/l. Boron was <200 µg/l. Total residue was 53 mg/l. MBAS level was 0.2 mg/l. Filterable residue was 51 mg/l. Specific conductance was 70 µmhos.

7. Site 23. Skimmer 4 located on the southside of building 745 servicing 29.5 acres of drainage showed the following results.

Day 1 showed the metals analysis none detected for the following: calcium 17.4 mg/l, iron 725 µg/l and magnesium 5.2 mg/l. EPA Methods 601 and 602 analyses showed none detected for all of the contaminants. Pesticide analysis, EPA Method 608, showed none detected. The BOD was 54 mg/l. The COD was 12 mg/l. O&G level was 0.50 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. MBAS was <0.1 mg/l. Filterable residue was 148 mg/l. Total residue was 95 mg/l. Specific conductance was 167 µmhos.

Day 2 showed that the metals analysis had none detected except for the following: calcium 17.2 mg/l, iron 979 µg/l, aluminum 192 µg/l and magnesium 5.2 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride 2.4 µg/l. EPA Method 602 showed none detected for all contaminants. The BOD was 75 mg/l. The COD was 25 mg/l. O&G level was 0.8 mg/l. Total extractable petroleum hydrocarbons 1.9 mg/l. Cyanide was <0.0005 mg/l.

Filterable residue was 105 mg/l. Total residue was 91 mg/l. MBAS level was <0.1 mg/l. Specific conductance was 166 µmhos.

Day 3 showed that the metals analysis had none detected except for the following: calcium 17.2 mg/l, iron 811 µg/l, and magnesium 5.1 mg/l. COD was 18 mg/l. O&G was 0.60 mg/l. Total extractable petroleum hydrocarbons was <1.0 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 101 mg/l. Total residue was 119 mg/l. MBAS level was <0.1 mg/l. Specific conductance was 167 umhos. Average three-day pH was 7.74.

8. Site 29. Industrial waste collection system near building 1204 showed the following results:

Day 1 showed that the metals analysis had none detected except for the following: calcium 12.2 mg/l, iron 461 µg/l, zinc 238 µg/l and magnesium 0.5 mg/l. EPA Methods 601 and 602 showed none detected for all of the contaminants. The COD was 32 mg/l. The BOD was 183 mg/l. O&G was 0.90 mg/l. Boron was <200 µg/l. Filterable residue was 60 mg/l. Total residue was 69 mg/l. MBAS level was 0.18 mg/l. Total extractable petroleum hydrocarbons was <1.0 mg/l. Specific conductance was 78 µmhos.

Day 2 showed the metals analysis had none detected except for the following: calcium 12 mg/l, iron 465 µg/l, zinc 230 µg/l and magnesium 0.5 mg/l. EPA Methods 601 and 602 showed none detected for all contaminants. The COD was 43 mg/l. The BOD was 115 mg/l. O&G was 0.8 mg/l. Cyanide level was <0.005 mg/l. Boron was <200 µg/l. Filterable residue was 76 mg/l. Total residue was 46 mg/l. MBAS level was 0.2 mg/l. Total extractable petroleum hydrocarbons was 22.8 mg/l.

Day 3 metals analysis showed none detected except for the following: calcium 12.1 mg/l, iron 445 µg/l, zinc 216 µg/l and magnesium 0.5 mg/l. The COD was 30 mg/l. O&G was 1.40 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. MBAS was 0.15 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 56 mg/l. Total residue was 73 mg/l. Boron was <200 µg/l. Specific conductance was 80 µmhos. Average three-day pH was 7.64.

9. Site 30. Industrial waste collection system near building 22 showed the following results:

Day 1 showed that the metals analysis had detected for the following: calcium 13.6 mg/l, zinc 271 µg/l, aluminum 258 µg/l, iron 1525 µg/l, and magnesium. EPA Methods 601 and 602 showed none detected for all of the contaminants. The BOD was 246 mg/l. The COD was 57 mg/l. O&G was 1.9 mg/l. Boron level was 300 µg/l. Filterable residue was 56 mg/l. Total residue was 133 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. Specific conductance was 88 µmhos. Pesticide analysis, EPA Method 608, showed none detected.

Day 2 showed the metals analysis had none detected except for the following: calcium 13.7 mg/l, iron 1693 µg/l, zinc 179 µg/l, aluminum 137 µg/l and magnesium 0.6 mg/l. EPA Methods 601 and 602 showed none detected for all contaminants. The BOD was 141 mg/l. The COD was 45 mg/l. O&G was <0.3 mg/l. Total extractable petroleum hydrocarbons. Cyanide level was <0.005 mg/l. Boron level was 200 µg/l. Filterable residue was 64 mg/l. Total

residue was 51 mg/l. MBAS level was 0.3 mg/l. Specific conductance was 86 µmhos.

Day 3 metals analysis showed none detected except for the following: calcium 13.7 mg/l, iron 1325 µg/l, zinc 246 µg/l, aluminum 117 µg/l and magnesium 0.6 mg/l. The COD was 43 mg/l. The boron level was 200 µg/l. O&G was 0.90 mg/l. Total extractable petroleum hyrocarbons were <1.0 mg/l. MBAS was 0.27 mg/l. Filterable residue was 62 mg/l. Total residue was 109 mg/l. Boron level was 109 mg/l. Specific conductance was 88 µmhos. Three-day pH average was 7.45.

10. Site 31. Facility 82037, skimmer 1, located south of building 1204 had the following results. Metals analysis showed none detected except for the following: cadmium 195 µg/l, calcium 16.8 mg/l, iron 2229 µg/l, zinc 193 µg/l, aluminum 246 µg/l; magnesium 6.4 mg/l and silver 12 µg/l. EPA Method 601 analysis showed none detected except for methylene chloride 1.8 µg/l. EPA Method 602 analysis showed none detected except for the following: ethyl benzene 12 µg/l, chlorobenzene 32 µg/l and toluene 31 µg/l. The COD was 925 mg/l. Cyanide was <0.005 mg/l. Boron level was 13000 µg/l. Total residue was 687 mg/l. MBAS level was 400 mg/l. Total extractable petroleum hydrocarbons was 216 mg/l. Specific conductance was 401 µmhos. pH was 6.61.

11. Site 34. Facility 82040, skimmer 6, located at the west end of Clover Creek sample was not analyzed.

12. Site 37. Facility 82034, skimmer 13, located south of building 342 showed the following results. The metals analysis showed none detected except for the following: calcium 2.1 mg/l, iron 180 µg/l, aluminum 12 µg/l and magnesium 0.2 mg/l. COD was 11 mg/l. The pH was 8.51. Cyanide was <0.005 mg/l. Total residue was 9 mg/l. MBAS was 0.10 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. O&G was <0.3 mg/l. Specific conductance was 24 µmhos.

13. Site 45. Skimmer 28 located south of building 1166 showed the following results. The metals analysis showed none detected except for the following: iron 1041 µg/l, zinc 1197 µg/l, magnesium 5.4 mg/l, and calcium 50 mg/l. EPA Method 601 analysis showed none detected except for methylene chloride 33 µg/l and trichloroethylene 94 µg/l. EPA Method 602 analysis could not be completed because of interfering organic compounds. The COD was 22 mg/l. The pH was 7.83. Cyanide level was <0.005 mg/l. Filterable residue was 224 mg/l. Total residue was 215 mg/l. MBAS was 00.1 mg/l. O&G was 0.90 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. Specific conductance was 363 µmhos. Discharges into Skimmer 9 then to Clover Creek.

14. Site 46. Skimmer 29 located south of building 1167 showed the following results. The metals analysis showed none detected except for the following: calcium 52.3 mg/l, copper 114 µg/l, iron 5817 µg/l, manganese 109 µg/l, zinc 1218 µg/l, aluminum 1382 µg/l, titanium 734 µg/l, mercury 2.6 µg/l and magnesium 6.7 mg/l. EPA Methods 601 and 602 could not be completed because of interfering organics. The pH was 7.48. The COD was 1025 mg/l. Cyanide level was 0.022 mg/l. Filterable residue was 670 mg/l. Total residue was 924 mg/l. MBAS level was 74.0 mg/l. O&G was 167.2 mg/l. Total extractable petroleum hydrocarbons was 55.6 mg/l. Specific conductance was 743 µmhos. Discharges into Skimmer 9 then into Clover Creek.

15. Site 47. Skimmer 30 located north of building 1167 showed the following results. The metals analysis showed none detected except for the following: cobalt 101 µg/l, barium 139 µg/l, cadmium 119 µg/l, calcium 90.8 mg/l, chromium 100 µg/l, copper 250 µg/l, iron 23910 µg/l, manganese 225 µg/l, zinc 2115 µg/l, aluminum 2410 µg/l, titanium 1032 µg/l, mercury 3.5 µg/l and magnesium 9.8 mg/l. EPA Method 602 analysis was not completed because of interfering organic compounds. The pH was 6.84. The COD was 1325 mg/l. Cyanide level was 0.025 mg/l. Filterable residue was 1148 mg/l. Total residue was 1470 mg/l. MBAS level was 340 mg/l. O&G level was 14.9 mg/l. Total extractable petroleum hydrocarbons was 65.6 mg/l. Specific conductance was 1063 µmhos. Discharges into skimmer 9 then into Clover Creek.

16. Site 48. Skimmer 31 located north of building 1169 showed the following results. The metals analysis showed none detected except for the following: calcium 29.7 mg/l, iron 1835 µg/l, zinc 315 µg/l, aluminum 149 µg/l and magnesium 1.0 mg/l. EPA Method 601 analysis had none detected except methylene chloride had 4.2 µg/l. EPA Method 602 analysis could not be completed because of interfering organic compounds. The pH was 8.23. The COD was 65 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 117 mg/l. Total residue 111 mg/l. MBAS level was 00.1 mg/l. O&G level was 2.5 mg/l. Total extractable petroleum hydrocarbons was <0.1 mg/l. Specific conductance was 190 µmhos. Discharges into skimmer 9 then into Clover Creek.

17. Site 49. Skimmer 32 located north of building 1170 showed the following results. The metals analysis showed none detected except for the following: calcium 26.3 mg/l, iron 107 µg/l, zinc 624 µg/l, and magnesium 0.6 mg/l. EPA Method 601 could not be analyzed because of interfering organic compounds. EPA Method 602 analysis could not be completed because of interfering organic compounds. The pH was 8.52. The COD was 25 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 370 mg/l. Total residue was 374 mg/l. MBAS level was 0.20 mg/l. O&G was 0.70 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. Specific conductance was 544 µmhos. Discharges into skimmer 9 then into Clover Creek.

18. Site 50. Skimmer 33A located east of building 1175 showed the following results. The metals analysis showed none detected except for the following: calcium 25.8 mg/l, iron 3449 µg/l, zinc 407 µg/l, aluminum 105 µg/l, and magnesium 6.6 mg/l. EPA Method 601 analysis showed none detected for all contaminants. EPA Method 602 analysis showed none detected except for ethyl benzene 2.2 µg/l. The pH was 7.80. The COD was 80 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 158 mg/l. Total residue was 155 mg/l. MBAS level was 0.20 mg/l. O&G level was 13.6 mg/l. Total extractable petroleum hydrocarbons were 9.4 mg/l. Specific conductance was 184 µmhos. Discharges into skimmer 1 then into Clover Creek.

19. Site 51. Skimmer 33B located west of building 1175 showed the following results. Metals analysis showed none detected except the following: calcium 38.9 mg/l, iron 7471 µg/l, zinc 472 µg/l, aluminum 335 µg/l and magnesium 4.2 mg/l. EPA Methods 601 and 602 analysis not complete because of interfering organics. The pH was 7.67. The COD was 118 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 158 mg/l. Total residue was 289 mg/l. MBAS level was 0.30 mg/l. O&G was 13.1 mg/l. Total extractable petroleum hydrocarbons were 53.6 mg/l. Specific conductance was 228 µmhos. Discharges into skimmer 1 then into Clover Creek.

20. Site 52. Skimmer 36 located east of Hangar 4 showed the following results. The metals analysis showed none detected except for barium 381 µg/l, calcium 42.9 µg/l, iron 16930 µg/l, manganese 760 µg/l, zinc 186 mg/l, aluminum 731 µg/l, and magnesium 4.7 mg/l. EPA Method 601 analysis showed none detected except for trans-1,3-dichloeopropen (trace); EPA Method 602 analysis could not be completed because of organic compounds. The pH was 7.51. The COD was 67 mg/l. Cyanide level was 0.010 mg/l. Filterable residue was 248 mg/l. Total residue was 315 mg/l. MBAS level was 0.30 mg/l. O&G was 2.8 mg/l. Total extractable petroleum hydrocarbons were <1.0 mg/l. Specific conductance was 399 µmhos.

21. Site 54. Facility 24011, skimmer 38, north of the civil engineering compound showed the following results. The metals analysis showed none detected except for the following: calcium 34.2 mg/l, barium 579 µg/l, chromium 379 µg/l, copper 291 µg/l, iron 26590 µg/l, manganese 704 µg/l, zinc 2898 µg/l, aluminum 12580 µg/l, titanium 258 µg/l and magnesium 4.8 µg/l. EPA Methods 601 and 602 could not be completed because of interfering organic compounds. The pH was 6.88. The COD was 525 mg/l. Filterable residue was 511 mg/l. Total residue was 1345 mg/l. MBAS level was 1.3 mg/l. O&G was 31.8 mg/l. Total extractable petroleum hydrocarbons were 10.1 mg/l. Specific conductance was 719 µmhos.

22. Site 56. Facility 42003, skimmer 40, near the petroleum oils and lubricants A area showed the following results. EPA Method 601 showed none detected except for trichlorofluoromethane 1.2 µg/l. EPA Method 602 analysis showed none detected except for ethyl benzene 242 µg/l and toluene 1202 µg/l. The pH was 6.41. The COD was 10250 mg/l. O&G was 5.90 mg/l. Total extractable hydrocarbons were 5.6 mg/l. Filterable residue was 244 mg/l. Total residue was 509 mg/l. MBAS level was 0.30 mg/l. Specific conductance was 275 µmhos.

29. Site 57. Facility 12002, skimmer 41 showed the following results. Metals analysis was none detected except calcium 32.6 mg/l, iron 4065 mg/l, zinc 174 µg/l, mercury 1.0 µg/l, and magnesium 0.6 µg/l. EPA Method 601 could not be performed because holding time had been expired. EPA Method 602 analysis showed none detected except for toluene 3.9 µg/l. The pH was 5.59. The COD was 38 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 125 mg/l. Total residue was 192 mg/l. MBAS level was 0.10 mg/l. O&G was 4 mg/l. Total extractable petroleum hydrocarbons were 2.8 mg/l. Specific conductance was 168 µmhos.

D. French Drain System

1. Site 35. Facility 82032, skimmer 10, located south of building 305 showed the following results. The metals analysis showed none detected except for the following: calcium 7.6 mg/l, zinc 179 µg/l, aluminum 157 µg/l and magnesium 0.3 mg/l. COD was 23 mg/l. The pH was 6.55. Cyanide level was <0.005 mg/l. Filterable residue was 71 mg/l. Total residue was 23 mg/l. Total extractable petroleum hydrocarbons were 1.5 mg/l. O&G were 2.10 mg/l. Specific conductance was 49 µmhos.

2. Site 36. Skimmer 11 located across from Lincoln building south of building 328 showed the following results. The metals analysis showed none

detected for the following: calcium 5.3 mg/l, iron 232 µg/l, zinc 421 µg/l, aluminum 121 µg/l and magnesium 0.7 mg/l. EPA Method 601 analysis showed none detected for methylene chloride 0.4 µg/l and 1,1-dichloroethane 2.2 µg/l. EPA Method 602 analysis showed none detected except for ethyl benzene 0.5 µg/l. COD was 40 mg/l. Cyanide was <0.005 mg/l. Total residue was 54 mg/l. O&G was 1.3 mg/l. Total extractable hydrocarbons were <1.0 mg/l. Specific conductance was 68 µmhos.

3. Site 39. Facility 82049, skimmer 15, located west of building 343 showed the following results. The metals analysis showed none detected except for the following: zinc 253 µg/l, calcium 8.2 mg/l and magnesium 0.4 mg/l. The pH was 9.34. The COD was 35 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 44 mg/l. Total residue was 174 mg/l. MBAS was 0.20 mg/l. O&G level was 0.90 mg/l. Total extractable petroleum hydrocarbons were <0.1 mg/l. Specific conductance was 55 µmhos.

4. Site 53. Skimmer 37 located at the burn pit showed the following results. The metals analysis showed none detected except for the following: calcium 13.6 mg/l, iron 6710 µg/l, manganese 403 µg/l, zinc 589 µg/l, aluminum 3457 µg/l, titanium 113 µg/l and magnesium 7.4 µg/l. EPA Methods 601 and 602 could not be completed because of interfering organic compounds. The pH was 6.79. The COD is 1850 mg/l. Cyanide level was <0.005 mg/l. Filterable residue was 245 mg/l. Total residue was 489 mg/l. MBAS level was 34 mg/l. O&G was 29.4 mg/l. Total extractable petroleum hydrocarbons was 24.6 mg/l. Specific conductance was 228 µmhos.

5. Site 55. Facility 82051, skimmer 39, near building 535 in the civil engineering compound showed the following results. EPA Method 602 analysis showed none detected except for toluene 31 µg/l. Metals analysis showed none detected except for the following: barium 221 µg/l, calcium 58.2 mg/l, iron 7862 µg/l, manganese 606 µg/l, zinc 5590 µg/l, aluminum 4138 µg/l, titanium 103 µg/l and magnesium 7.6 µg/l. EPA Method 601 showed none detected for all contaminants. The COD was 148 mg/l. Filterable residue was 132 mg/l. Total residue was 1312 mg/l. MBAS level was 0.50 mg/l. O&G was 6.10 mg/l. Total extractable petroleum hydrocarbons were 13.4 mg/l. Specific conductance was 356 µmhos.

V. CONCLUSIONS

A. Presently, the only regulatory requirement for McChord AFB is the NPDES permit. Effluent meets permit limitations.

B. Some of the oil/water separators had a build-up of grit and sludge observed during the survey. These separators should be cleaned and have scheduled routine maintenance.

C. During the second week of sampling, discharge from the commissary and BX Auto Care Shop sanitary sewer line contained concentrated motor oil. Lt Scott and Sgt Casey spoke with Mr McClain, the shop supervisor. They inspected the area for leakage and spills. The only place where oil could enter the sanitary sewer was through the oil/water separator. The oil would have to be poured directly from containers into the oil/water separator causing the oil to go directly into the sanitary sewer.(4)

D. High boron levels were found at Base Reproduction, 318 FIS AGE the Auto Craft Center, and Facility 82037. Boron is commonly found in photoprocessing chemicals such as fixers and developers and aircraft soaps.

E. High levels of petroleum hydrocarbons (>15 mg/l) were found at the following: Liquid Fuels and Power Production, Welding Shop, Special Purpose, Flight Line 2, Facility 82049, oil/water separators from north and south of 1167 and the burn pit, and Pump Station 17. This may indicate that fuel and oil are discharged directly to the sanitary sewer and also that the oil/water separators are not working effectively.

F. High oil and grease levels (>15 mg/l) were found at Rainier Dining Facility; Commissary; Castle Dining Facility; NCO; O'Club; oil/water separators at 318 FIS AGE, Fire Station, Welding Shop, Special Purpose, Facility 82037, Bldg 342, Facility 82049, 739 NW, 792 NE, 1120 S, 1167 S, Burn Pit, and Facility 24011; Flight Line 2; Housing; and Pump Station 17. Oil and grease level is a combination of fats and oils with petroleum hydrocarbons. The high levels in the sanitary sewer indicate that grease traps are not working or that there are no grease traps.

G. High surfactant levels (>1.0 mg/l) were found at the Commissary; Rainier Dining Facility; oil/water separators for Special Purpose, Facility 82037, Facility 82033, Bldg 342, Facility 82049, 739 NW, 792 NE, 1120 S, 1167 S, 1167 N, Burn Pit, and Facility 42003. High surfactant levels are usually associated with concentrated aircraft detergents.

H. High levels of zinc (>1000 µg/l) were found at Liquid Fuels and Power Production, Welding Shop, Electroplating Shop and Facility 82051. Zinc is usually found in electroplating and the production of alloys. Hardness of the water plays an important part of a limit set for a stream. The concentration of zinc should not exceed the numerical value given by $e(0.83[\ln(\text{hardness})]+1.95)$ at any time.(1) Zinc is found in battery cans, grommetts and welding solder.

I. High COD levels (>400 mg/l) occurred at Liquid Fuels and Power Production, Commissary, Rainier Dining Hall, NCO Club, O'Club, Welding Shop, Electroplating Shop, Special Purpose, Facility 82037, Facility 82049, oil/water separators for bldgs 739 NW, 732 NE, 1120 S, 1167 S, 1167 N, Burn Pit, and Facility 42003. COD is a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. This can be related to the cleaning solvents or detergents used in the clean-up process.

J. High cyanide levels (>0.02 mg/l) were found at the oil/water separators for 739 NW, 1120 S, 1167 S and 1167 N. Cyanide is typically found in effluents of metal plating and chemical industries. Some other sources might be film bleaching chemicals and laundry detergents.

K. High total suspended solids (>250 mg/l) were found at the Commissary, and Ranier Dining Facility.

L. High levels of iron (>1000 µg/l) were found at Liquid Fuels and Power Production; Auto Craft Center; Flight Line 1; Flight Line 2; Industrial waste collection, bldg 22; oil/water separators for 318 FIS Age, Fire Station,

Steam Plant, Welding Shop, Electroplating Shop, 62 TRANS Motor Pool, 8 acres of buildings, Special Purpose, bldg 776, Facility 82037, Facility 82033, Facility 82049, bldg 739 NW, bldg 792 NE, bldg 1120 S, bldg 1166 S, bldg 1167 S, bldg 1167 N, bldg 1169 N, bldg 1175 E, bldg 1175 W, East Hangar 4, Facility 24011, Facility 82051; and Facility 42003. Iron is found in engine blocks, fly-wheels, gears, camshafts and pipes. Washing and corrosion of parts and pipes can cause high levels of iron.

M. Levels of titanium were found at oil/water separators for 318 FIS AGE, Welding Shop, Electroplating Shop, Facility 82049, bldg 739 NW, bldg 1167 S, bldg 1167 N, East Hangar 4, Facility 24011, and Facility 82051. Titanium is a constituent of paints, pipes, aircraft forging and compressor parts.

N. Levels of mercury were found at oil/water separators for the Welding Shop, bldg 342, bldg 739 NW, bldg 792 NE, bldg 1167 S, and bldg 1167 N. Most of these samples were one grab samples. Mercury is found in manometers and welding solder.

O. Levels of silver were found at oil/water separators for bldg 792 NE, and bldg 1120 S. Halogen acids, sulfur compounds and ammonia cause corrosion of silver.(2)

P. High levels of aluminum (>1000 µg/l) from oil/water separators for bldg 1167 S, bldg 1167 N, East Hangar 4, Facility 24011, and Facility 82051. Aluminum is found in structural parts, aircraft and heavy forgings. This is possibly due to stripping of aircraft and disassociation of aluminum ions.

Q. Levels of methylene chloride, dichlorodifluoromethane, 1,1-Dichloroethane, vinyl chloride, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, benzene, toluene, 1,2-Dichlorobenzene, ethyl benzene, chlorobenzene, carbon tetrachloride, chloroethane, trans-1,2-dichloroethane, trichlorofluromethane, and 1,1,1-trichloroethane were found at Liquid Fuels and Power Production, Commissary, Rainier Dining Facility, Castle Dining Facility, NCO Club, O'Club, oil/water separators for: 318 FIS AGE, Auto Craft Center, Fire Station, Electroplating Shop, 62nd TRANS Motor Pool, 8 acres of buildings, Bldg 1178 SE, 29.5 acres of drainage, 62nd TRANS Special Purpose, industrial waste collection point-bldg 1204, Facility 82037, Facility 82031, Facility 82033, Bldg 328 S, Bldg 342, Facility 82049 W and SE, Bldg 739 NW, Bldg 792 NE, Bldg 1120 S, Bldg 1167 S, Bldg 1167 N, Bldg 1169 N, Bldg 1175 E, Hangar 4, Facilitiy 82051, Facility 42003, and Facility 12002; Flight Line 1, Flight Line 2, Housing, and Pump Station 17. EPA Methods 601 and 602 were used to analyze for these chemicals. These chemical contaminants are constituents in refrigerants, foaming agents, degreasants, solvents, gasoline products, pesticides, and aviation fuels.

R. From using the Marsh-McBirney 201D flowmeter, the average influent of Clover Creek was 18,150 gallons/day. The average effluent flow was approximately 26,250 gallons/day. The base contributes approximately 8,100 gallons/day to Clover Creek. The influent and effluent averages are based on three days of flow measurments taken on 25 Sep 89, 27 Sep 89 and 28 Sep 89.

S. pH levels that fell outside the 6.5-8.5 range included oil/water separators for: Welding Shop, Special Purpose, Facility 82031, Facility 82049 W, Facility 82049 SE, Jet Engine Test Cell and Facility 12002. The discharge was either too acidic or too basic.

VI. RECOMMENDATIONS

A. Methylene chloride was found almost base-wide. Cleaning and degreasing processes were stated as possible sources. Since the actual processes within each shop were unknown, it is hard to pinpoint exactly the source. The base should use BEE chemical-use documents or other environmental audit information (ECAMP) to identify the specific chemicals and process creating the contamination. A hazardous waste survey can also be performed to determine the source.

B. Determine if the Commissary, Castle and Ranier Dining Halls, NCO and O'Club have grease traps to catch the oil and grease from cooking. If they do have grease traps, perform routine maintenance. If they do not have grease traps, then installing them might be a solution to lower the oil and grease levels.

C. Determine if the photo processing chemicals, fixers and developers, and biodegradable aircraft soaps contain boron. Since boron is not presently regulated, this is not a compliance problem. However, other bases are now being regulated for this chemical.

D. Determine disposal practices for petroleum hydrocarbons of the shops listed in the Conclusions, section V.E, and the oil/water separator maintenance. Petroleum hydrocarbons can coat the biological organisms and revent oxygen transfer.

E. Collect additional samples for zinc analysis. Routine maintenance on the oil/water separators should decrease the concentration of zinc. Measure total hardness and calculate maximum zinc levels.

F. Perform routine maintenance on oil/water separators. This should lower the petroleum hydrocarbon levels going into the storm and sanitary sewer. Install or perform routine maintenance on grease traps. These steps may lower the oil and grease level going into the sanitary or storm sewer.

G. Since high surfactant levels are caused by detergents, dilute the detergent and this will decrease the concentration of surfactants discharging into the sanitary or storm sewer.

H. Take three additional samples for cyanide to get a better characterization of the wastewater. Investigate the shops identified to determine what products contain cyanide and if possible substitute other products. Cyanide is not presently regulated but other bases are presently regulated for this chemical.

I. Total suspended solids (TSS) are regulated for the Fort Lewis Sewage Treatment Plant. Since the amount of flow from the base will dilute the amount of TSS going into the sewage treatment plant, the TSS will be lower than that measured from the oil/water separators.

J. High levels of iron were detected in the shops identified in the Conclusions, section V.L, of the report. Maintenance of the oil/water separators should lower the iron levels.

K. Collect three additional samples for titanium from the shops identified in the Conclusions, section V.M, to get a better characterization of the wastewater.

L. Collect additional samples for mercury. Investigate the source of mercury in the shops identified. Set up traps for mercury to prevent mercury from going into the sanitary sewer.

M. Collect additional samples for silver. Determine operation that contains or utilizes silver during the process. A silver recovery unit can be used to prevent silver discharge to the sanitary sewer.

N. Collect additional samples for aluminum. Routine oil/water separator maintenance should lower the aluminum levels.

O. Since the pH from Fort Lewis Sewage Treatment plant is regulated by a NPDES permit, it is important to monitor the pH of the oil/water separators that discharge into Clover Creek and into the sewage treatment plant. Perform pH on the oil/water separators that are listed in the Conclusions, section V.S on a routine basis.

P. Volatile aromatics and halocarbons using EPA Methods 601 and 602 were found throughout the sites. These chemicals are being discharged into the storm and sanitary sewer. Collect additional samples from the shops listed in the Conclusions, section V.Q, to have a better characterization of the wastewater.

REFERENCES

1. APHA, Standard Methods for the Examination of Water and Wastewater, 17th Ed., American Public Health Association, Washington DC, 1987.

2. Conversation with Dick Pitzen, Plant Operator, Fort Lewis Sewage Treatment Plant, 21 September 1989.

3. Conversation with Paula Woffort, Engineer, Fort Lewis Grounds, Roads/Sewers, 26 September 1989.

4. Conversation with Mr McClain, AAFES manager, McChord AFB Auto Care Shop, 26 September 1989.

5. Wastewater Sampling for Process and Quality Control, Water Pollution Control Federation, Washington DC, 1980.

6. USEPA, Methods for Chemical Analysis of Water and Wastewater, EPA-600/4-79-020, March 1983.

7. Code of Federal Regulations Title 40, Part 403 - General Pretreatment Regulations for Existing and New Sources of Pollution, Office of the Federal Register, Washington DC, 1987.

APPENDIX A

REQUEST LETTER

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 62D MILITARY AIRLIFT WING (MAC)
MCCHORD AIR FORCE BASE, WASHINGTON 98438

REPLY TO ATTN OF SGPB (AV 976-3921)

12 AUG 1988

SUBJECT Request Water Quality Evaluation

TO 62 CES/DEEV
HQ MAC/SGPB
USAFOEHL/ECQ
IN TURN

We are requesting that the USAF Occupational and Environmental Health Laboratory Water Quality Function (USAFOEHL/ECQ) do a wastewater characterization survey at McChord AFB. This survey will enable us to identify water pollution sources and assess them before problems arise. In addition, the evaluation will be used as part of our base water pollution inventory. If you have any questions concerning this request, call the undersigned at AUTOVON 976-3921.

ROBERT A. TETLA, JR, Capt, USAF, BSC
Chief, Bioenvironmental Engineering Services

1st Ind, 62 CES/DEEV

TO: HQ MAC/SGPB

I concur.

MICHAEL J. GRENKO
Environmental Program Manager
12 Aug 88

2nd Ind, HQ MAC/SGPB (AV 576-2306) 7 September 1988

TO: USAF OEHL/CC

Request your assistance in performing the survey described above.

WYATT L. MCGHEE, Colonel, USAF, BSC
Chief, Bioenvironmental Engineering
Office of the Command Surgeon

cc: HQ MAC/DEEV
62 CES/DEEV
USAF Clinic McChord/SGPB

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APPENDIX B

WASTEWATER ANALYTICAL DATA

BIOCHEMICAL OXYGEN DEMAND, CHEMICAL OXYGEN DEMAND, OIL AND GREASE, TOTAL HYDROCARBONS, CYANIDE, RESIDUE, SPECIFIC CONDUCTANCE, MBAS, AND PH

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BIOCHEMICAL OXYGEN DEMAND, CHEMICAL OXYGEN DEMAND, OIL AND GREASE, TOTAL HYDROCARBONS, CYANIDE, RESIDUE, SPECIFIC CONDUCTANCE, MBAS, AND PH

PARAMETERS		SITE						
	units	1	2	3	4	5		
						1	2	3
pH		8.53	8.48	7.27	----			
BOD	mg/l	----	----	----	----	344	248	----
COD	"	----	253	750	----	506	385	975
O&G	"	----	0.90	8.20	----	----	144	91.2
Petro Hydro	"	----	----	96.0	----	----	----	----
MBAS	"	----	0.10	0.60	----	0.32	0.19	6.00
Cyanide	"	----	0.012	0.017	----	0.008	0.012	0.016
Residue								
Filterable	"	----	334	678	----	310	496	1270
Nonfilt	"	----	1	9	----	4	260	130
Settleable	ml/l	----	1	5.7	----	1.0	10.0	32.0
Total	mg/l	----	432	943	----	334	673	3362
Boron	µg/l	----	18500	----	----	----	----	----
Specific conductance	µmhos	----	699	800	----	858	1219	1045

PARAMETERS		SITE						
	units	6			7	8		
		1	2	3		1	2	3
pH					7.76			
BOD	mg/l	411	1703	----	----	----	342	----
COD	"	800	4500	750	75	470		24041
O&G	"	608	416	65.6	----	37.6	44.8	0.60
Petro Hydro	"	----	----	----	----	----	----	----
MBAS	"	2.76	7.2	3.70	0.10	0.2	0.13	<0.1
Cyanide	"	----	<0.005	<0.005	<0.005	0.012	0.012	<0.005
Residue								
Filterable	"	388	516	404	222	328	344	175
Nonfilt	"	236	312	20	1	<1.0	92	10
Settleable	ml/l	0.6	<0.2	<0.2	<0.2	6.0	3.6	0.3
Total	mg/l	499	730	781	227	394	342	158
Boron	µg/l	----	----	----	3500	----	----	----
Specific conductance	µmhos	324	525	412	415	520	894	290

PARAMETERS	units	SITE 9			10			11
		1	2	3	1	2	3	
pH							7.26	
BOD	mg/l	277	----	----	17	108	----	----
COD	"	470	710	340	1375	860	950	15
O&G	"	370	----	84.8	22.0	34.4	20.0	0.50
Petro Hydro	"	----	----	----	----	----	----	----
MBAS	"	0.36	0.13	----	<0.1	<0.1	<0.1	----
Cyanide	"	0.005	<0:005	<0.005	0.017	<0.005	<0.005	----
Residue								
Filterable	"	388	315	----	332	293	536	90
Nonfilt	"	7	176	40	10	196	13	<1.0
Settleable	ml/l	0.7	0.8	----	2.2	0.6	8.0	0:5
Total	mg/l	551	366	434	534	413	1006	94
Boron	µg/l	----	----	----	----	----	----	----
Specific conductance	µmhos	462	438	470	470	343	626	138

PARAMETERS	units	SITE 12	13	14	15	16	17	18
pH		6.94	6.52	6.70	7.26	6.55	6.35	----
BOD	mg/l	----	----	----	----	----	----	----
COD	"	<10	445	65	18	263	4100	4760
O&G	"	0:60	37.1	1.40	40.8	----	143.2	----
Petro Hydro	"	----	19.5	2.6	1.9	----	96.4	----
MBAS	"	----	0.30	0.30	0.70	----	----	----
Cyanide	"	----	<0.005	<0.005	<0.005	----	0.012	----
Residue								
Filterable	"	94	196	126	95	204	1877	828
Nonfilt	"	<1.0	11	<1.0	3	12	22	50
Settleable	ml/l	<0.2	0:3	0:3	<0.2	2.5	2.2	1.0
Total	mg/l	103	407	213	117	254	2470	714
Boron	µ g/l	----	900	350	<200	----	----	----
Specific conductance	µmhos	148	255	195	126	169	1463	1183

PARAMETERS		SITE							
	units	20	21			22	23		
			1	2	3		1	2	3
pH		7.35				7.12			
BOD	mg/l	----	123	30.7	----	----	54	75	----
COD	"	22	43	45	30	18	12	25	18
O&G	"	2.40	0.60	0.8	0.60	1.2	0.50	0.8	0.60
Petro Hydro	"	<1.0	----	<1.0	<1.0	<1.0	<1.0	1.9	<1.0
MBAS	"	<0.1	0.17	0.14	----	0.20	<0.1	<0.1	<0.1
Cyanide	"	----	----	<0.005	<0.005	<0.005	----	<0.005	<0.005
Residue									
Filterable	"	171	75	88	60	51	148	105	101
Nonfilt	"	<1.0	6	32	<1.0	<1.0	3	28	<1.0
Settleable	ml/l	0.4	0.3	<0.2	<0.2	0.4	0.3	1.0	<0.2
Total	mg/l	187	90	37	88	53	95	91	119
Boron	µg/l	----	----	----	----	<200	----	----	----
Specific conductance	µmhos	229	86	84	----	70	167	166	167

PARAMETERS		SITE							
	units	24	25		26			27	
				1	2	3	1	2	3
pH		5.05	6.84						
BOD	mg/l	----	----	493	293	----	623	424	----
COD	"	4760	80	210	255	506	206	310	430
O&G	"	190.0	5.50	4.80	6.1	4.00	37.6	9.4	48.4
Petro Hydro	"	38.4	<1.0	1.9	5.8	1.9	17.3	25.3	37.4
MBAS	"	3.80	0.20	0.26	0.19	0.30	0.15	0.13	0.20
Cyanide	"	----	----	----	----	----	----	----	----
Residue									
Filterable	"	634	94	328	320	276	344	158	256
Nonfilt	"	<1.0	21	<1.0	44	20	5	28	13
Settleable	ml/l	0.72	<0.2	<0.2	1.5	1.8	0.9	0.4	3.3
Total	mg/l	656	174	271	288	457	301	208	548
Tot volatile	"	----	----	----	81	----	----	----	----
Boron	µg/l	----	----	----	----	----	----	----	----
Specific conductance	µmhos	388	182	776	730	531	587	484	520

PARAMETERS	units	SITE 28			29			30		
		1	2	3	1	2	3	1	2	3
pH										
BOD	mg/l	180	211	----	183	115	----	246	141	----
COD	"	200	158	145	32	43	30	57	45	43
O&G	"	81.2	6.4	10.2	0.90	0.8	1.40	1.90	<0.3	0.90
Petro Hydro	"	----	----	----	<1.0	22.8	<1.0	<1.0	---	<1.0
MBAS	"	0.25	0.20	0.10	0:18	0.20	0:15	----	0.3	0:27
Cyanide	"	----	----	----	----	<0.005	<0:005	----	<0.005	---
Residue										
Filterable	"	488	283	244	60	76	56	64	96	62
Nonfilt	"	9	20	<1.0	6	8	<1.0	88	24	2
Settleable	ml/l	2.5	0.5	0:3	0.2	0.3	<0:2	0.5	<0.2	0.3
Total	mg/l	411	317	324	69	46	73	133	51	109
Boron	µg/l	----	----	----	<200	<200	<200	300	200	200
Specific conductance	µmhos	598	550	592	78	76	80	88	86	88

PARAMETERS	units	SITE 31	32	33	35	36	37	38	39
pH		6.65	8.68	6.02	6.55		8.51	7.53	9.34
BOD	mg/l	----	----	----	----	----	----	----	----
COD	"	925	----	258	23	40	11	205	35
O&G	"	216	----	14.9	2.10	1.30	<0.3	43.20	0.90
Petro Hydro	"	8:2	----	36.6	1.5	<1.0	<1.0	13.7	<1.0
MBAS	"	400	----	17:0	----	----	0:10	1.80	0:20
Cyanide	"	<0.005	----	<0.005	<0.005	<0.005	<0:005	<0.005	<0.005
Residue									
Filterable	"	543	----	250	71	70	29	168	44
Nonfilt	"	6		3	<1.0	<1.0	<1.0	2	<1.0
Settleable	ml/l	2.3	----	0.2	<0.2	<0.2	<0.2	0.2	<0.2
Total	mg/l	687	----	274	23	54	9	279	174
Boron	µg/l	13000	----	----	----	----	----	----	----
Specific conductance	µmhos	401	----	260	49	68	24	314	55

PARAMETERS	units	SITE 40	41	42	43	44	45	46	47
pH		9.39	5.95	7.98	6.10	6.30	7.83	7.48	6.84
BOD	mg/l	----	----	----	----	----	----	----	----
COD	"	1600	<10.0	5900	6200	1300	22	1025	1325
O&G	"	108.0	<0.3	81.6	91.6	23.6	0.90	167.2	14.9
Petro Hydro	"	38.0	<1.0	60.8	104.4	5.5	<1.0	55.6	65.6
MBAS	"	52.0	<1.0	4.00	38.0	5.00	00.1	74.0	340
Cyanide	"	0.006	<0.005	0.123	0.010	0.075	<0.005	0.022	0.025
Residue									
Filterable	"	263	89	859	1395	326	224	670	1148
Nonfilt	"	30	<1.0	15	51	6	<1.0	65	<1.0
Settleable	ml/l	1.0	<0.2	1.3	2.7	3.7	0.20	1.1	1.1
Total	mg/l	1600	73	1466	2059	381	215	924	1470
Boron	µg/l	----	----	----	----	----	----	----	----
Specific conductance	µmhos	1031	135	338	474	261	363	743	1063
Ammonia	mg/l	5.0	----	----	----	----	----	----	----

PARAMETERS	units	SITE 48	49	50	51	52	53	54	56
pH		8.23	8.52	7.80	7.67	7.51	6.79	6.88	6.41
BOD	mg/l	----	----	----	----	----	----	----	----
COD	"	65	25	80	118	67	1850	525	10250
O&G	"	2.50	0.70	13.6	13.1	2.8	29.4	31.8	5.90
Petro Hydro	"	<1.0	<1.0	9.4	53.6	<1.0	24.6	10.1	5.6
MBAS	"	0.1	0.20	0.20	0.30	0.30	34.0	1.30	244
Cyanide	"	<0.005	<0.005	<0.005	<0.005	0.010	<0.005	---	----
Residue									
Filterable	"	117	370	158	158	248	245	511	244
Nonfilt	"	<1.0	<1.0	1	7	<1.0	3	13	3
Settleable	ml/l	3.8	0.9	0.2	7.3	2.5	1.4	10.7	1.4
Total	mg/l	111	374	155	289	315	489	1345	509
Boron	µg/l	----	----	----	----	----	----	----	----
Specific conductance	µmhos	190	544	184	228	399	228	719	275

PARAMETERS		SITE		
	units	57	58	55
pH		5.59	7.31	
BOD	mg/l	----	----	----
COD	"	38	220	148
O&G	"	4.0	74	6.10
Petro Hydro	"	2:8	408	13:4
MBAS	"	0:1	0.20	0.50
Cyanide	"	<0:005	0:006	----
Residue				
Filterable	"	125	208	132
Nonfilt	"	5	<1.0	6
Settleable	ml/l	1.1	0:2	11.5
Total	mg/l	192	228	1312
Boron	µg/l	----	----	----
Specific conductance	µmhos	168	564	356

APPENDIX C

PESTICIDE RESULTS

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PESTICIDE RESULTS

Analyte	Detection Limit	Site Number					
		21	23	26	27	30	59
Aldrin	.05	ND	ND	ND	.13	ND	ND
alpha-BHC	.01	ND	ND	ND	.11	ND	ND
Beta-BHC	.01	ND	ND	.10	ND	ND	ND
delta-BHC	.01	ND	ND	ND	ND	ND	ND
Lindane	.01	ND	ND	ND	ND	ND	ND
Chlordane	.05	ND	ND	ND	ND	ND	ND
4,4' -DDD	.01	ND	ND	ND	ND	ND	ND
4,4' -DDE	.05	ND	ND	.52	ND	ND	ND
4,4' -DDT	.05	ND	ND	ND	ND	ND	ND
Dieldrin	.05	ND	ND	ND	ND	ND	ND
Endosulfan I	.02	ND	ND	ND	ND	ND	ND
Endosulfan II	.02	ND	ND	ND	ND	ND	ND
Endolsulfan Sulfate	.02	ND	ND	ND	ND	ND	ND
Endrin	.05	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	.01	ND	ND	ND	ND	ND	ND
Heptachlor	.01	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	.1	ND	ND	ND	ND	ND	ND
Toxaphene	.5	ND	ND	ND	ND	ND	ND
Arochlor 1016	.5	ND	ND	ND	ND	ND	ND
Arochlor 1221	.5	ND	ND	ND	ND	ND	ND
Arochlor 1232	.5	ND	ND	ND	ND	ND	ND
Arochlor 1242	.5	ND	ND	ND	ND	ND	ND
Arochlor 1248	.5	ND	ND	ND	ND	ND	ND
Arochlor 1254	.5	ND	ND	ND	ND	ND	ND
Arochlor 1260	.5	ND	ND	ND	ND	ND	ND
Methoxychlor	.01	ND	ND	ND	ND	ND	ND

Results in µg/l

ND - None Detected

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APPENDIX D

VOLATILE HALOCARBONS

EPA METHOD 601

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VOLATILE HALOCARBONS EPA METHOD 601

Analyte	Units	Site Number							
		3	8			10			
			1	2	3	1	2	3	
Chloroform	µg/l	<0.3	<0.3	5.0		209			
Methylene chloride	"	2.4	<0.4			31			
Bromodichloromethane	"	<0.4	<0.4						
Bromoform	"	<0.7	<0.7						
Carbon Tetrachloride	"	<0.5	<0.5						
Chlorobenzene	"	<0.6	<0.6						
Chloroethane	"	<0.9	<0.9						
Chloromethane	"	<0.8	<0.8						
Chlorodibromomethane	"	<0.5	<0.5						
1,2-Dichlorobenzene	"	<1.0	<1.0						
1,3-Dichlorobenzene	"	<0.5	<0.5						
1,4-Dichlorobenzene	"	<0.7	<0.7						
Dichlorodifluoromethane	"	4.0	<0.9						
1,1-Dichloroethane	"	0.9	<0.4						
1,2-Dichloroethane	"	<0.3	<0.3						
1,1-Dichloroethene	"	<0.3	<0.3						
trans-1,2-Dichloroethene	"	<0.5	<0.5						
1,2-Dichloropropane	"	<0.3	<0.3						
cis-1,3-Dichloropropene	"	<0.5	<0.5						
trans-1,3-Dichloropropene	"	<0.5	<0.5						
1,1,2,2-Tetrachloroethane	"	<0.5	<0.5						
Tetrachloroethylene	"	<0.6	<0.6						
1,1,1-Trichlorethane	"	<0.5	<0.5						
1,1,2-Trichloroethane	"	<0.5	<0.5						
Trichloroethylene	"	<0.5	<0.5						
Trichlorofluoromethane	"	<0.4	<0.4						
Vinyl chloride	"	4.0	<0.9						
Bromomethane	"	<0.9	<0.9						
2-Chloroethylvinyl ether	"	<0.9	<0.9						

Analyte	Units	Site Number					
		5			6		
		1	2	3	1	2	3
Chloroform	µg/l	<0.3	<0.3			93	
Methylene chloride	"	3.9	<0.4			28	
Bromodichloromethane	"	<0.4	<0.4				
Bromoform	"	<0.7	<0.7				
Carbon Tetrachloride	"	<0.5	<0.5				
Chlorobenzene	"	<0.6	<0.6				
Chloroethane	"	<0.9	<0.9				
Chloromethane	"	<0.8	<0.8				
Chlorodibromomethane	"	<0.5	<0.5				
1,2-Dichlorobenzene	"	<1.0	<1.0				
1,3-Dichlorobenzene	"	<0.5	<0.5				
1,4-Dichlorobenzene	"	<0.7	<0.7				
Dichlorodifluoromethane	"	<0.9					
1,1-Dichloroethane	"	<0.4					
1,2-Dichloroethane	"	<0.3	<0.3				
1,1-Dichloroethene	"	<0.3	<0.3				
trans-1,2-Dichloroethene	"	<0.5	<0.5				
1,2-Dichloropropane	"	<0.3	<0.3				
cis-1,3-Dichloropropene	"	<0.5	<0.5				
trans-1,3-Dichloropropene	"	<0.5	<0.5				
1,1,2,2-Tetrachloroethane	"	<0.5	<0.5				
Tetrachloroethylene	"	<0.6	<0.6				
1,1,1-Trichlorethane	"	<0.5	<0.5				
1,1,2-Trichloroethane	"	<0.5	<0.5				
Trichloroethylene	"	<0.5	<0.5				
Trichlorofluoromethane	"	<0.4	<0.4				
Vinyl chloride	"	<0.9					
Bromomethane	"	<0.9	<0.9				
2-Chloroethylvinyl ether	"	<0.9	<0.9				

VOLATILE HALOCARBONS EPA METHOD 601

Analyte	Units	Site Number						
		3	8			10		
			1	2	3	1	2	3
Chloroform	µg/l	<0.3	<0.3	5.0		209		
Methylene chloride	"	2.4	<0.4			31		
Bromodichloromethane	"	<0.4	<0.4					
Bromoform	"	<0.7	<0.7					
Carbon Tetrachloride	"	<0.5	<0.5					
Chlorobenzene	"	<0.6	<0.6					
Chloroethane	"	<0.9	<0.9					
Chloromethane	"	<0.8	<0.8					
Chlorodibromomethane	"	<0.5	<0.5					
1,2-Dichlorobenzene	"	<1.0	<1.0					
1,3-Dichlorobenzene	"	<0.5	<0.5					
1,4-Dichlorobenzene	"	<0.7	<0.7					
Dichlorodifluoromethane	"	4.0	<0.9					
1,1-Dichloroethane	"	0.9	<0.4					
1,2-Dichloroethane	"	<0.3	<0.3					
1,1-Dichloroethene	"	<0.3	<0.3					
trans-1,2-Dichloroethene	"	<0.5	<0.5					
1,2-Dichloropropane	"	<0.3	<0.3					
cis-1,3-Dichloropropene	"	<0.5	<0.5					
trans-1,3-Dichloropropene	"	<0.5	<0.5					
1,1,2,2-Tetrachloroethane	"	<0.5	<0.5					
Tetrachloroethylene	"	<0.6	<0.6					
1,1,1-Trichlorethane	"	<0.5	<0.5					
1,1,2-Trichloroethane	"	<0.5	<0.5					
Trichloroethylene	"	<0.5	<0.5					
Trichlorofluoromethane	"	<0.4	<0.4					
Vinyl chloride	"	4.0	<0.9					
Bromomethane	"	<0.9	<0.9					
2-Chloroethylvinyl ether	"	<0.9	<0.9					

Analyte	Units	Site Number				
		1	9 2	3	12	13
Chloroform	µg/l	0.3			<0.3	
Methylene chloride	"	<0.4	33			69
Bromodichloromethane	"	<0.7				
Bromoform	"	<0.5				
Carbon Tetrachloride	"	<0.6				
Chlorobenzene	"	<0.9				
Chloroethane	"	<0.9				
Chloromethane	"	<0.8				
Chlorodibromomethane	"	<0.5				
1,2-Dichlorobenzene	"	<1.0				
1,3-Dichlorobenzene	"	<0.5				
1,4-Dichlorobenzene	"	<0.7				
Dichlorodifluoromethane	"	<0.9				
1,1-Dichloroethane	"	<0.4				
1,2-Dichloroethane	"	<0.3				
1,1-Dichloroethene	"	<0.3				
trans-1,2-Dichloroethene	"	<0.5				
1,2-Dichloropropane	"	<0.3				
cis-1,3-Dichloropropene	"	<0.5				
trans-1,3-Dichloropropene	"	<0.5				
1,1,2,2-Tetrachloroethane	"	<0.5				
Tetrachloroethylene	"	<0.6				
1,1,1-Trichlorethane	"	<0.5				
1,1,2-Trichloroethane	"	<0.5				
Trichloroethylene	"	<0.5				
Trichlorofluoromethane	"	<0.4				
Vinyl Chloride	"	<0.9				
Bromomethane	"	<0.9				
2-Chloroethylvinyl ether	"	<0.9				

Analyte	Units	Site Number				
		14	15	17	18	20
Chloroform	µg/l	<0.3		*		
Methylene chloride	"	118	123		16814	1.00
Bromodichloromethane	"	<0.4				
Bromoform	"	<0.7				
Carbon Tetrachloride	"	<0.5				
Chlorobenzene	"	<0.6				
Chloroethane	"	<0.9				
Chloromethane	"	<0.8				
Chlorodibromomethane	"	<0.5				
1,2-Dichlorobenzene	"	<1.0				
1,3-Dichlorobenzene	"	<0.5				
1,4-Dichlorobenzene	"	<0.7				
Dichlorodifluoromethane	"	<0.9				
1,1-Dichloroethane	"	<0.4				
1,2-Dichloroethane	"	<0.3				
1,1-Dichloroethene	"	<0.3				
trans-1,2-Dichloroethene	"	<0.5				
1,2-Dichloropropane	"	<0.3				
cis-1,3-Dichloropropene	"	<0.5				
trans-1,3-Dichloropropene	"	<0.5				
1,1,2,2-Tetrachloroethane	"	<0.5				
Tetrachloroethylene	"	<0.6				
1,1,1-Trichlorethane	"	<0.5				
1,1,2-Trichloroethane	"	<0.5				
Trichloroethylene	"	<0.5				
Trichlorofluoromethane	"	<0.4				
Vinyl chloride	"	<0.9				
Bromomethane	"	<0.9				
2-Chloroethylvinyl ether	"	<0.9				

*=analysis couldn't be completed due to interfering organic compounds

Analyte	Units	Site Number					
		21		22	23		
		1	2	3	1	2	3
Chloroform	µg/l	<0.3			<0.3		
Methylene chloride	"	<0.4		1.8	217	2.4	
Bromodichloromethane	"	<0.4					
Bromoform	"	<0.7					
Carbon Tetrachloride	"	<0.5					
Chlorobenzene	"	<0.6					
Chloroethane	"	<0.9					
Chloromethane	"	<0.8					
Chlorodibromomethane	"	<0.5					
1,2-Dichlorobenzene	"	<1.0					
1,3-Dichlorobenzene	"	<0.5					
1,4-Dichlorobenzene	"	<0.7					
Dichlorodifluoromethane	"	<0.9					
1,1-Dichloroethane	"	<0.4					
1,2-Dichloroethane	"	<0.3					
1,1-Dichloroethene	"	<0.3					
trans-1,2-Dichloroethene	"	<0.5					
1,2-Dichloropropane	"	<0.3					
cis-1,3-Dichloropropene	"	<0.5					
trans-1,3-Dichloropropene	"	<0.5					
1,1,2,2-Tetrachloroethane	"	<0.5					
Tetrachloroethylene	"	<0.6					
1,1,1-Trichlorethane	"	<0.5					
1,1,2-Trichloroethane	"	<0.5					
Trichloroethylene	"	<0.4					
Trichlorofluoromethane	"	<0.4					
Vinyl Chloride	"	<0.9					
Bromomethane	"	<0.9					
2-Chloroethylvinyl ether	"	<0.9					

Analyte	Units	Site Number				
		24	25	26		
				1	2	3
Chloroform	µg/l	<0.3	<0.3	<0.3		
Methylene chloride	"	8.1	<0.4		3.1	
Bromodichloromethane	"	<0.4				
Bromoform	"	<0.7				
Carbon Tetrachloride	"	35	<0.5			
Chlorobenzene	"	<0.6				
Chloroethane	"	<0.9				
Chloromethane	"	<0.8				
Chlorodibromomethane	"	<0.5				
1,2-Dichlorobenzene	"	<1.0				
1,3-Dichlorobenzene	"	<0.5				
1,4-Dichlorobenzene	"	<0.7				
Dichlorodifluoromethane	"	<0.9				
1,1-Dichloroethane	"	<0.4				
1,2-Dichloroethane	"	<0.3				
1,1-Dichloroethene	"	<0.3				
trans-1,2-Dichloroethene	"	<0.5				
1,2-Dichloropropane	"	<0.3				
cis-1,3-Dichloropropene	"	<0.5				
trans-1,3-Dichloropropene	"	<0.5				
1,1,2,2-Tetrachloroethane	"	<0.5				
Tetrachloroethylene	"	<0.6				
1,1,1-Trichlorethane	"	15	<0.5			
1,1,2-Trichloroethane	"	<0.5				
Trichloroethylene	"	<0.5				
Trichlorofluoromethane	"	<0.4				
Vinyl chloride	"	<0.9				
Bromomethane	"	<0.9				
2-chloroethylvinyl ether	"	<0.9				

Analyte	Units	Site Number					
		27			28		
		1	2	3	1	2	3
Chloroform	µg/l	<0.3	<0.3		6.9		
Methylene chloride	"	38			1.2	19.0	
Bromodichloromethane	"	<0.4					
Bromoform	"	<0.7					
Carbon Tetrachloride	"	<0.5					
Chlorobenzene	"	<0.6					
Chloroethane	"	<0.9					
Chloromethane	"	<0.8					
Chlorodibromomethane	"	<0.5					
1,2-Dichlorobenzene	"	<1.0					
1,3-Dichlorobenzene	"	<0.5					
1,4-Dichlorobenzene	"	<0.7					
Dichlorodifluoromethane	"	<0.9					
1,1-Dichloroethane	"	<0.4					
1,2-Dichloroethane	"	<0.3					
1,1-Dichloroethene	"	<0.3					
trans-1,2-Dichloroethene	"	<0.5					
1,2-Dichloropropane	"	<0.3					
cis-1,3-Dichloropropene	"	<0.5					
trans-1,3-Dichloropropene	"	<0.5					
1,1,2,2-Tetrachloroethane	"	<0.5					
Tetrachloroethylene	"	<0.6					
1,1,1-Trichlorethane	"	<0.5					
1,1,2-Trichloroethane	"	<0.5					
Trichloroethylene	"	<0.5					
Trichlorofluoromethane	"	<0.4					
Vinyl chloride	"	<0.9					
Bromomethane	"	<0.9					
2-chloroethylvinyl ether	"	<0.9					

Analyte	Units	Site Number					
		29			30		
		1	2	3	1	2	3
Chloroform	µg/l	<0.3	<0.3		<0.3	<0.3	
Methylene chloride	"	<0.4					
Bromodichloromethane	"	<0.4					
Bromoform	"	<0.7					
Carbon Tetrachloride	"	<0.5					
Chlorobenzene	"	<0.6					
Chloroethane	"	<0.9					
Chloromethane	"	<0.8					
Chlorodibromomethane	"	<0.5					
1,2-Dichlorobenzene	"	<1.0					
1,3-Dichlorobenzene	"	<0.5					
1,4-Dichlorobenzene	"	<0.7					
Dichlorodifluoromethane	"	<0.9					
1,1-Dichloroethane	"	<0.4					
1,2-Dichloroethane	"	<0.3					
1,1-Dichloroethene	"	<0.3					
trans-1,2-Dichloroethene	"	<0.5					
1,2-Dichloropropane	"	<0.3					
cis-1,3-Dichloropropene	"	<0.5					
trans-1,3-Dichloropropene	"	<0.5					
1,1,2,2,-Tetrachloroethane	"	<0.5					
Tetrachloroethylene	"	<0.6					
1,1,1-Trichlorethane	"	<0.5					
1,1,2-Trichloroethane	"	<0.5					
Trichloroethylene	"	<0.5					
Trichlorofluoromethane	"	<0.4					
Vinyl chloride	"	<0.9					
Bromomethane	"	<0.9					
2-chloroethylvinyl ether	"	<0.9			<0.9		

Analyte	Units		Site Number					
			31	32	33	34	35	36
Chloroform	µg/l	<0.3						
Methylene chloride	"		1.8	49	0.7	<0.4	0.4	
Bromodichloromethane	"	<0.4						
Bromoform	"	<0.7						
Carbon Tetrachloride	"	<0.5						
Chlorobenzene	"	<0.6						
Chloroethane	"	<0.9						
Chloromethane	"	<0.8						
Chlorodibromomethane	"	<0.5						
1,2-Dichlorobenzene	"	<1.0						
1,3-Dichlorobenzene	"	<0.5						
1,4-Dichlorobenzene	"	<0.7						
Dichlorodifluoromethane	"		<0.9	11				
1,1-Dichloroethane	"		<0.4				2.2	
1,2-Dichloroethane	"	<0.3						
1,1-Dichloroethene	"	<0.3						
trans-1,2-Dichloroethene	"	<0.5						
1,2-Dichloropropane	"	<0.3						
cis-1,3-Dichloropropene	"	<0.5						
trans-1,3-Dichloropropene	"	<0.5						
1,1,2,2-Tetrachloroethane	"		<0.5					
Tetrachloroethylene	"	<0.6						
1,1,1-Trichlorethane	"	<0.5						
1,1,2-Trichloroethane	"	<0.5						
Trichloroethylene	"	<0.5						
Trichlorofluoromethane	"	<0.4						
Vinyl chloride	"		<0.9	11				
Bromomethane	"	<0.9						
2-chloroethylvinyl ether	"	<0.9						

Analyte	Units	Site Number						
		38	40	42	43	44	45	46
Chloroform	µg/l	<0.3	<0.3	*			*	
Methylene chloride	"	5.7			27	11		33
Bromodichloromethane	"	<0.4						
Bromoform	"	<0.7						
Carbon Tetrachloride	"	<0.5						
Chlorobenzene	"	<0.6						
Chloroethane	"	<0.9						
Chloromethane	"	<0.8						
Chlorodibromomethane	"	<0.5						
1,2-Dichlorobenzene	"	<1.0						
1,3-Dichlorobenzene	"	<0.5						
1,4-Dichlorobenzene	"	<0.7						
Dichlorodifluoromethane	"	11						
1,1-Dichloroethane	"	<0.4						
1,2-Dichloroethane	"	<0.3						
1,1-Dichloroethene	"	<0.3						
trans-1,2-Dichloroethene	"	<0.5						
1,2-Dichloropropane	"	<0.3						
cis-1,3-Dichloropropene	"	<0.5						
trans-1,3-Dichloropropene	"	<0.5						
1,1,2,2-Tetrachloroethane	"	<0.5						
Tetrachloroethylene	"	<0.6						
1,1,1-Trichlorethane	"	<0.5						
1,1,2-Trichloroethane	"	<0.5						
Trichloroethylene	"	<0.5					94	
Trichlorofluoromethane	"	<0.4						
Vinyl chloride	"	11				57		
Bromomethane	"	<0.9						
2-chloroethylvinyl ether	"	<0.9						

*=analysis couldn't be completed due to interfering organic compounds

Analyte	Units	Site Number							
		47	48	49	50	51	52	53	54
Chloroform	µg/l	*	<0.3	*		*		*	*
Methylene chloride	"		4.2		1.7				
Bromodichloromethane		"	<0.4						
Bromoform	"		<0.7						
Carbon Tetrachloride	"		<0.5						
Chlorobenzene	"		<0.6						
Chloroethane	"		<0.9					2.2	
Chloromethane	"		<0.8						
Chlorodibromomethane	"		<0.5						
1,2-Dichlorobenzene	"		<1.0						
1,3-Dichlorobenzene	"		<0.5						
1,4-Dichlorobenzene	"		<0.7						
Dichlorodifluoromethane	"		<0.9						
1,1-Dichloroethane	"		<0.4					9.7	
1,2-Dichloroethane	"		<0.3						
1,1-Dichloroethene	"		<0.3						
trans-1,2-Dichloroethene	"		<0.5					trace	
1,2-Dichloropropane	"		<0.3						
cis-1,3-Dichloropropene	"		<0.5						
trans-1,3-Dichloropropene	"		<0.5						
1,1,2,2-Tetrachloroethane	"		<0.5						
Tetrachloroethylene	"		<0.6						
1,1,1-Trichlorethane	"		<0.5						
1,1,2-Trichloroethane	"		<0.5						
Trichloroethylene	"		<0.5						
Trichlorofluoromethane	"		<0.4					0.5	
Vinyl chloride	"		<0.9						
Bromomethane	"		<0.9						
2-chloroethylvinyl ether	"		<0.9						

*=analysis couldn't be completed due to interfering organic compounds

Analyte	Units	Site Number			
		56	57	58	55
Chloroform	µg/l	<0.3	*		
Methylene chloride	"	<0.4		4.0	
Bromodichloromethane	"	<0.4			
Bromoform	"	<0.7			
Carbon Tetrachloride	"	<0.5			
Chlorobenzene	"	<0.6			
Chloroethane	"	<0.9			
Chloromethane	"	<0.8			
Chlorodibromomethane	"	<0.5			
1,2-Dichlorobenzene	"	<1.0			
1,3-Dichlorobenzene	"	<0.5			
1,4-Dichlorobenzene	"	<0.7		14	
Dichlorodifluoromethane	"	<0.9			
1,1-Dichloroethane	"	<0.4		9.8	
1,2-Dichloroethane	"	<0.3			
1,1-Dichloroethene	"	<0.3			
trans-1,2-Dichloroethene	"	<0.5			
1,2-Dichloropropane	"	<0.3			
cis-1,3-Dichloropropene	"	<0.5			
trans-1,3-Dichloropropene	"	<0.5			
1,1,2,2-Tetrachloroethane	"	<0.5			
Tetrachloroethylene	"	<0.6			
1,1,1-Trichlorethane	"	<0.5		58	
1,1,2-Trichloroethane	"	<0.5			
Trichloroethylene	"	<0.5			
Trichlorofluoromethane	"	1.2			0.4
Vinyl chloride	"	<0.9			
Bromomethane	"	<0.9			
2-chloroethylvinyl ether	"	<0.9			

*=analysis couldn't be completed due to interfering organic compounds

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APPENDIX E

VOLATILE AROMATICS

EPA METHOD 602

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VOLATILE AROMATICS EPA METHOD 602

Analyte	Units	Site Number			
		3	5	6	
				1	2
1,3-Dichlorobenzene	µg/l	1.8	2.1	<0.5	<0.5
1,4-Dichlorobenzene	"	<0.7	6.7	<0.7	
Ethyl benzene	"	<0.3	<0.3	<0.3	
Chlorobenzene	"	<0.6	<0.6	<0.6	
Benzene	"	<0.5	3.3	<0.5	
Toluene	"	<0.3	2.7	<0.3	
1,2-Dichlorobenzene	"	<1.0	1.4	<1.0	

Analyte	Units	Site Number						
			8		9		10	12
		1	2	3	1	2		
1,3-Dichlorobenzene	µg/l	<0.5	<0.5		<0.5	<0.5		<0.5
1,4-Dichlorobenzene	"	<0.7			<0.7			
Ethyl benzene	"	<0.3			<0.3			
Chlorobenzene	"	<0.6			<0.6			
Benzene	"	0.7			<0.5			
Toluene	"	<0.3			<0.3		0.4	
1,2-Dichlorobenzene	"	<1.0			<1.0			

Analyte	Units	Site Number						
		13	14	15	17	20	21	
							1	2
1,3-Dichlorobenzene	µg/l	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	"	<0.7	<0.7					
Ethyl benzene	"	<0.3	<0.3	3.8				
Chlorobenzene	"	<0.6	0.7	3.2				
Benzene	"	<0.5	<0.5					
1,2-Dichlorobenzene	"	<1.0	<1.0	15				
Toluene	"	<0.3	<0.3					

Analyte	Units	Site Number						
		22	23		24	25	26	
			1	2			1	2
1,3-Dichlorobenzene	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5		2.0
1,4-Dichlorobenzene	"	<0.7						3.4
Ethyl benzene	"	<0.3					1.1	
Chlorobenzene	"	<0.6					2.8	
Toluene	"	<0.3					12	
Benzene	"	<0.5						
1,2-Dichlorobenzene	"	<1.0						

Analyte	Units	Site Number					
		27		28		29	
		1	2	1	2	1	2
1,3-Dichlorobenzene	µg/l	<0.5				<0.5	<0.5
1,4-Dichlorobenzene	"	<0.7			1.6		
Ethyl benzene	"	1.4	0.9	1.9	0.9		
Chlorobenzene	"	3.2	4.3	<0.6	1.2		
Toluene	"	21	1.3	19	<0.3		
Benzene	"	1.1		<0.5			
1,2-Dichlorobenzene	"	<1.0		<1.0			

Analyte	Units	Site Number						
		30		31	32	36	38	40
		1	2					
1,3-Dichlorobenzene	µg/l	<0.5	<0.5					
1,4-Dichlorobenzene	"	<0.7						
Ethyl benzene	"	<0.3		12		0.5		
Chlorobenzene	"	<0.6		32				
Toluene	"	<0.3		31				26
Benzene	"	<0.5			73		0.9	35
1,2-Dichlorobenzene	"	<1.0						

Analyte	Units	Site Number						
		42	43	44	45	46	47	48
1,3-Dichlorobenzene	µg/l	<0.5	*	*	*	*	*	*
1,4-Dichlorobenzene	"	<0.7						
Ethyl benzene	"	<0.3						
Chlorobenze	"	<0.6						
Benzene	"	88						
Toluene	"	<0.3						
1,2-Dichlorobenzene	"	<1.0						

*=analysis couldn't be completed due to interfering organic compounds

Analyte	Units	Site Number					
		49	50	51	52	53	54
1,3-Dichlorobenzene	µg/l	<0.5	*	*	*	*	*
1,4-Dichlorobenzene	"	<0.7					
Ethyl benzene	"	<0.3	2.2				
Chlorobenze	"	<0.6					
Benzene	"	<0.5					
1,2-Dichlorobenzene	"	<1.0					

*=analysis couldn't be completed due to interfering organic compounds

Analyte	Units	Site Number			
		55	56	57	58
1,3-Dichlorobenzene	µg/l	<0.5			
1,4-Dichlorobenzene	"	<0.7			426
Ethyl benzene	"	<0.3	242		36
Chlorobenzene	"	<0.6			
Benzene	"	<0.5			5.3
Toluene	"	31	1202	3.9	176
1,2-Dichlorobenzene	"	<1.0			

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APPENDIX F

ICP METAL SCREEN

EPA METHOD 200.7

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ICP METAL SCREEN EPA METHOD 200.7

METAL	UNIT	SITE NUMBER			
		1	2	3	4
Calcium	mg/l	22.0	15.5	16.3	15.5
Arsenic	µg/l	<100	<100	<100	<100
Barium	"	<100	<100	<100	<100
Beryllium	"	<100	<100	<100	<100
Cadmium	"	<100	<100	<100	<100
Chromium	"	<100	<100	<100	<100
Copper	"	<100	<100	<100	<100
Iron	"	429	846	1158	<100
Manganese	"	<100	<100	<100	<100
Nickel	"	<100	<100	<100	<100
Zinc	"	394	<100	6340	<100
Aluminum	"	262	<100	155	<100
Cobalt	"	<100	<100	<100	<100
Titanium	"	<100	<100	<100	<100
Vanadium	"	<100	<100	<100	<100
Molybdenum	"	<100	<100	<100	<100
Mercury	"	<1.0	<1.0	<1.0	
Magnesium	mg/l	8:3	9:3	8:0	
Silver	µg/l	----	<10	----	

METAL	UNIT	SITE NUMBER						
		7	8	9	10	11	12	
Calcium	mg/l	9.0				12.6	13.2	
Arsenic	µg/l	<100				<100	<100	
Barium	"	<100				<100	<100	
Beryllium	"	<100				<100	<100	
Cadmium	"	<100				<100	<100	
Chromium	"	<100				<100	<100	
Copper	"	<100				<100	<100	
Iron	"	<100				167	<100	
Manganese	"	<100				<100	<100	
Nickel	"	<100				<100	<100	
Zinc	"	<100				<100	<100	
Aluminum	"	377				<100	<100	
Cobalt	"	<100				<100	<100	
Titanium	"	<100				<100	<100	
Vanadium	"	<100				<100	<100	
Molybdenum	"	<100				<100	<100	
Mercury	"	<1.0				<1.0	<1.0	
Magnesium	mg/l	5.7				4.4	4.9	
Silver	µg/l	188	----	----	----	----	<10	<10

METAL	UNIT	SITE NUMBER					
		13	14	15	16	17	18
Calcium	mg/l	17.3	18.5	9.5	32.8	99.5	54.1
Arsenic	µg/l	<100	<100	<100	<100	<100	<100
Barium	"	<100	<100	<100	<100	201	149
Beryllium	"	<100	<100	<100	<100	<100	<100
Cadmium	"	<100	<100	<100	<100	191	612
Chromium	"	<100	<100	<100	<100	202	111
Copper	"	<100	<100	<100	<100	160	170
Iron	"	3218	5972	2112	2137	83400	118250
Manganese	"	<100	<100	<100	<100	884	456
Nickel	"	<100	<100	<100	<100	<100	<100
Zinc	"	633	209	310	884	2357	2752
Aluminum	"	274	<100	279	219	1689	2674
Cobalt	"	<100	<100	<100	<100	156	<100
Titanium	"	104	<100	<100	<100	1157	1595
Vanadium	"	<100	<100	<100	<100	<100	<100
Molybdenum	"	<100	<100	<100	<100	<100	261
Mercury	"	<1.0	<1.0	<1.0	<1.0	2.8	<1.0
Magnesium	mg/l	5.1	5.9	5.9	0.5	18.2	12.7

METAL	UNIT	SITE NUMBER							
		19	20	21			22	23		
				1	2	3		1	2	3
Calcium	mg/l	12.9	13.5	12.9	12.8	10.0	17.4	17.2	17.2
Arsenic	µg/l	<100	<100	<100	<100	<100	<100	<100	<100	<100
Barium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Beryllium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Chromium		<100	<100	<100	<100	<100	<100	<100	<100	<100
Copper	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Iron	"	1113	1618	1487	1016	273	725	979	811
Manganese	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Nickel	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Zinc	"	141	<100	<100	<100	1856	<100	192	<100
Aluminum	"	434	<100	<100	<100	<100	<100	<100	<100	<100
Cobalt	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Titanium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Vanadium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Molybdenum	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Mercury	"	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Magnesium	mg/l	6.5	0.4	0.4	0.4	0.2	5.2	5.2	5.1

METAL	UNIT	SITE NUMBER							
		24	25	26			27		
				1	2	3	1	2	3
Calcium	mg/l	25.3	17.3	11:5	12.7	14.9	17:6	15.0	19.0
Arsenic	µg/l	<100	<100	<100	<100	<100	<100	<100	<100
Barium	"	<100	<100	<100	<100	<100	<100	<100	<100
Beryllium	"	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium	"	<100	<100	<100	<100	<100	<100	<100	<100
Chromium	"	<100	<100	<100	<100	<100	<100	<100	<100
Copper	"	<100	<100	<100	<100	<100	<100	<100	<100
Iron	"	39400	6550	1400	817	1325	444	364	1049
Manganese	"	134	111	<100	<100	<100	<100	<100	<100
Nickel	"	<100	<100	<100	<100	<100	<100	<100	<100
Zinc	"	562	<100	186	168	1901	202	151	563
Aluminum	"	359	<100	<100	<100	246	125	104	354
Cobalt	"	<100	<100	<100	<100	<100	<100	<100	<100
Titanium	"	<100	<100	<100	<100	<100	<100	<100	<100
Vanadium	"	<100	<100	<100	<100	<100	<100	<100	<100
Molybdenum	"	191	<100	<100	<100	<100	<100	<100	<100
Mercury	"	<1:0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Magnesium	mg/l	7:6	5:1	5:7	5:8	6:1	7:6	6:8	7:6

METAL	UNIT	SITE NUMBER								
		28			29			30		
		1	2	3	1	2	3	1	2	3
Calcium	mg/l	22:7	21.4	21.9	12:2	12.0	12.1	13:6	13.7	13.7
Arsenic	µg/l	<100	<100	<100	<100	<100	<100	<100	<100	<100
Barium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Beryllium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Chromium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Copper	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Iron	"	510	262	300	461	465	445	1525	1693	1325
Manganese	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Nickel	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Zinc	"	112	<100	<100	238	230	216	271	179	246
Aluminum	"	175	<100	<100	<100	<100	<100	258	137	117
Cobalt	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Titanium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Vanadium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Molybdenum	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Mercury	"	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Magnesium	mg/l	8:2	8:2	8:3	0:5	0:5	0:5	0:6	0:6	0:6
Silver	µg/l	----	----	----	----	----	----	<10	<10	<10

METAL	UNIT	SITE NUMBER					
		31	32	33	34	35	36
Calcium	mg/l	16.8		42.5		7.6	5.3
Arsenic	µg/l	<100		<100		<100	<100
Barium	"	<100		<100		<100	<100
Beryllium	"	<100		<100		<100	<100
Cadmium	"	195		<100		<100	<100
Chromium	"	<100		<100		<100	<100
Copper	"	<100		<100		<100	<100
Iron	"	2229		1043		101	232
Manganese	"	<100		<100		<100	<100
Nickel	"	<100		<100		<100	<100
Zinc	"	193		1455		179	421
Aluminum	"	246		<100		157	121
Cobalt	"	<100		<100		<100	<100
Titanium	"	<100		<100		<100	<100
Vanadium	"	<100		<100		<100	<100
Molybdenum	"	<100		<100		<100	<100
Mercury	"	<1.0		<1.0		<1.0	<1.0
Magnesium	mg/l	6:4		4:6		0:3	0:7
Silver	µg/l	12		<10		<10	<10

METAL	UNIT	SITE NUMBER					
		37	38	39	40	41	42
Calcium	mg/l	2.1	31.3	8.2	49.2	17.9	10.2
Arsenic	µg/l	<100	<100	<100	<100	<100	<100
Barium	"	<100	<100	<100	<100	<100	<100
Beryllium	"	<100	<100	<100	<100	<100	<100
Cadmium	"	<100	<100	<100	<100	<100	<100
Chromium	"	<100	<100	<100	<100	<100	<100
Copper	"	<100	<100	<100	153	<100	147
Iron	"	<100	968	<100	13750	132	3124
Manganese	"	<100	<100	<100	162	<100	<100
Nickel	"	<100	<100	<100	<100	<100	<100
Zinc	"	180	3151	253	2133	1005	1171
Aluminum	"	<100	<100	<100	575	<100	407
Cobalt	"	<100	<100	<100	<100	<100	<100
Titanium	"	<100	<100	<100	319	<100	270
Vanadium	"	<100	<100	<100	<100	<100	<100
Molybdenum	"	<100	<100	<100	<100	<100	<100
Mercury	"	<1.0	2:2	<1.0	<1.0	<1.0	1:8
Magnesium	mg/l	0:2	7.3	0:4	6:0	0:3	3.4
Silver	µg/l	<10	<10	<10	<10	<10	<10

METAL	UNIT	SITE NUMBER					
		43	44	45	46	47	48
Calcium	mg/l	22.0	24.2	50.0	52.3	90.8	29.7
Arsenic	µg/l	<100	<100	<100	<100	<100	<100
Barium	"	<100	<100	<100	<100	139	<100
Beryllium	"	<100	<100	<100	<100	<100	<100
Cadmium	"	<100	<100	<100	<100	119	<100
Chromium	"	<100	<100	<100	<100	100	<100
Copper	"	256	<100	<100	114	250	<100
Iron	"	5956	12220	1041	5817	230910	1835
Manganese	"	139	312	<100	109	225	<100
Nickel	"	<100	<100	<100	<100	<100	<100
Zinc	"	560	2456	1197	1218	2115	315
Aluminum	"	717	<100	<100	1382	2410	149
Cobalt	"	<100	<100	<100	<100	101	<100
Titanium	"	<100	<100	<100	734	1032	<100
Vanadium	"	<100	<100	<100	<100	<100	<100
Molybdenum	"	<100	<100	<100	<100	<100	<100
Mercury	"	1:8	<1.0	<1.0	2:6	3:5	<1.0
Magnesium	mg/l	6.1	8:3	5:4	6.7	9.8	1:0
Silver	µg/l	14	15	<10	<10	<10	<10

METAL	UNIT	SITE NUMBER						
		49	50	51	52		53	54
					1	2		
Calcium	mg/l	26.3	25.8	38.9	13.6	42.9	----	34.2
Arsenic	µg/l	<100	<100	<100	<100	<100	----	<100
Barium	"	<100	<100	<100	<100	381	----	579
Beryllium	"	<100	<100	<100	<100	<100	----	<100
Cadmium	"	<100	<100	<100	<100	<100	---	<100
Chromium	"	<100	<100	<100	<100	<100	----	379
Copper	"	<100	<100	<100	<100	<100	----	291
Iron	"	107	3449	7471	6710	16930	----	26590
Manganese	"	<100	<100	<100	403	760	----	704
Nickel	"	<100	<100	<100	<100	<100	----	<100
Zinc	"	624	407	472	589	186	----	2898
Aluminum	"	<100	105	335	3457	731	----	12580
Cobalt	"	<100	<100	<100	<100	<100	----	<100
Titanium	"	<100	<100	<100	113	<100	----	258
Vanadium	"	<100	<100	<100	<100	<100	----	<100
Molybdenum	"	<100	<100	<100	<100	<100	----	<100
Mercury	"	<1.0	<1.0	<1.0	<1.0	<1.0	----	<1.0
Magnesium	mg/l	0:6	6:6	4:2	7:4	4:7	----	4:8
Silver		<10	<10	<10	<10		<10	<10

METAL	UNIT		SITE NUMBER		
			56	58	55
Calcium	mg/l	----	32.6	9.8	58.2
Arsenic	µg/l	----	<100	<100	<100
Barium	"	----	<100	<100	221
Beryllium	"	----	<100	<100	<100
Cadmium	"	----	<100	<100	<100
Chromium	"	----	<100	<100	<100
Copper	"	----	<100	<100	<100
Iron	"	----	4065	226	7862
Manganese	"	----	<100	<100	606
Nickel	"	----	<100	<100	<100
Zinc	"	----	174	140	5590
Aluminum	"	----	<100	<100	4138
Cobalt	"	----	<100	<100	<100
Titanium	"	----	<100	<100	103
Vanadium	"	----	<100	<100	<100
Molybdenum	"	----	<100	<100	<100
Mercury	"	----	1:0	<1.0	<1.0
Magnesium	mg/l	----	0.6	5:1	7:6
Silver	µg/l	<10	<10	----	----

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